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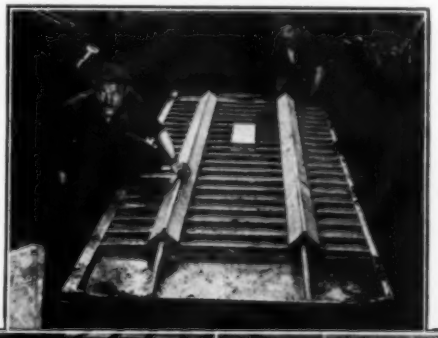
How To Mold a Planer Table

Method of Preparing and Venting the Sand Bed To Prevent Scabbing on the Face —Attention Is Directed To Faults of Omission and Commission in Pattern Making Practice

BY R. H. PALMER

WHEN preparing to make a planer bed casting from the pattern shown in Fig. 1, a pit is prepared in the floor in the usual manner with binders, cinder bed, and vent pipes. Loose parts that may be added to or removed from, the face of the pattern with the object of producing a longer or shorter casting, are arranged at the end of the pattern at the front, Fig. 1. After the proper amount of sand is rammed over the cinders, straight edges are bedded in to correspond with the lines of the table indicated at *A*, *B*, *C* and *D* Fig. 1. Sand is filled in, rammed to the top of the straight edges and then struck-off between them to a depth of ½-inch. The molder feels all over the face with his fingers and fills any soft spots after which the face of the mold is vented all over down to the cinder bed. A thickness of facing sand is spread over the bed and scraped off ⅛-inch above the top of the straight edges. The facing sand is made up of 4 parts of new Albany sand, 4 parts old sand, 1 part coarse fire sand, 1 part sea coal, thoroughly mixed and wet down with plain water. One straight edge, provided with a ½-inch projection on one side and with the other side straight, is employed in the three successive steps required to form the bed on which to place the pattern.



In the first step the projecting side of the straight edge serves to remove the ½-inch thickness of sand below the edge of the straight edges. In the second step a piece of wood ⅛-inch thick is held under the strike at each end as it is pulled along by a molder at each end. In the third step the straight side of the strike is employed as a ramming device in forcing the ⅛-inch thickness of sand down flush with the upper edge of the long straight edges. The man at each end of the strike alternately

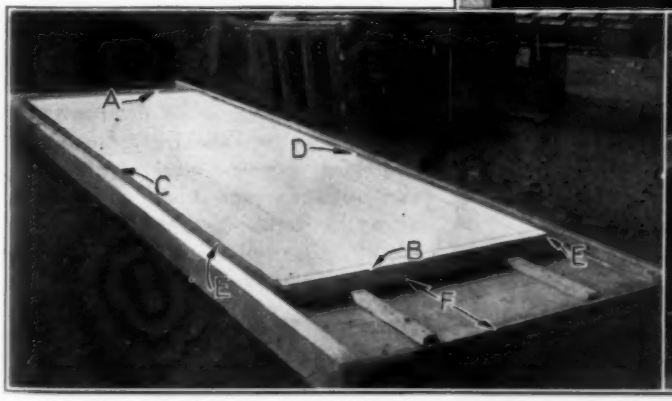


FIG. 1—THE PATTERN IS MADE IN SECTIONS TO SERVE FOR LONG AND SHORT CASTINGS FIG. 2—AFTER THE BED IS PREPARED SAND IS TUCKED UP UNDER THE SIDES AND ENDS OF THE PATTERN FIG. 3—THE PATTERN IS REMOVED TEMPORARILY TO FACILITATE RODDING AND VENTING THE PROJECTING BODY OF SAND

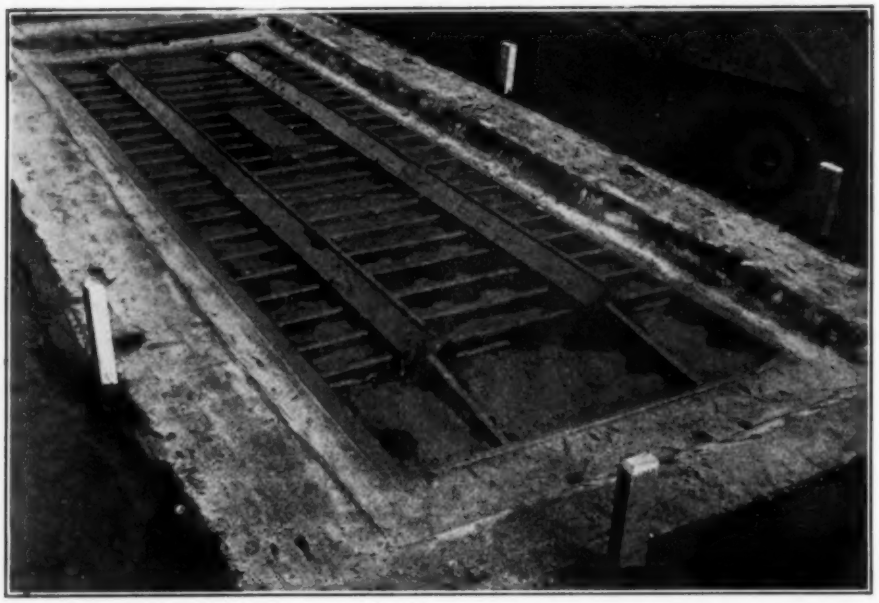


FIG. 4—CONSIDERABLE SAND REMAINS ON THE PATTERN WHEN THE COPE IS LIFTED

holds his end down on the straight edge while the other man uses his end as a paddle to beat down the sand. They gradually advance along the bed until the entire surface is uniform. A bed made in this manner never will cause trouble from cutting or scabbing if it is properly vented and if provision is made for the free egress of the steam and gas generated during the pouring process. In the event that the facing sand is weak in bond it may be corrected by the addition of a little flour or any other core binder.

Secure Long Pockets

After the bed is formed and the straight edges removed, the pattern is placed with the table surface resting on the bed. In Fig. 2 the molders are shown tucking facing sand up under the edge that forms a channel along both sides and under the ends as shown at *E* and *F* in Fig. 1. The pattern then is staked and lifted out and leaves a sand impression like that shown in Fig. 3. The projecting body of sand is carefully rodded, vented, nailed and finished and this is a part of the work that requires a considerable degree of skill and knowledge on the part of the molder. If the work is not done properly at this stage no subsequent treatment will prevent the casting from being a *waster*.

Ram Sand Around Pattern

The pattern is replaced, the guide stakes removed and sand is rammed around the pattern up to the floor level. In the particular example chosen for illustration, a cope with straight bars was employed and therefore it became necessary to make the parting on which the cope rested as high as the top of the V-guides on the pattern. Had a special cope been provided with bars cut to accommodate the *V*-guides the parting might have been made flush with the outer edge of the pattern. Chucks and long gaggers were employed to carry the hanging body of sand and after the cope was rammed and lifted off, the mold appeared as shown in Figs. 4 and 8. It will be noted that a considerable quantity of sand along the ribs failed to lift with the cope and remained on the pattern. This condition will be referred to later.

The finished cope is shown in Fig. 6 and the finished drag in Fig. 7.

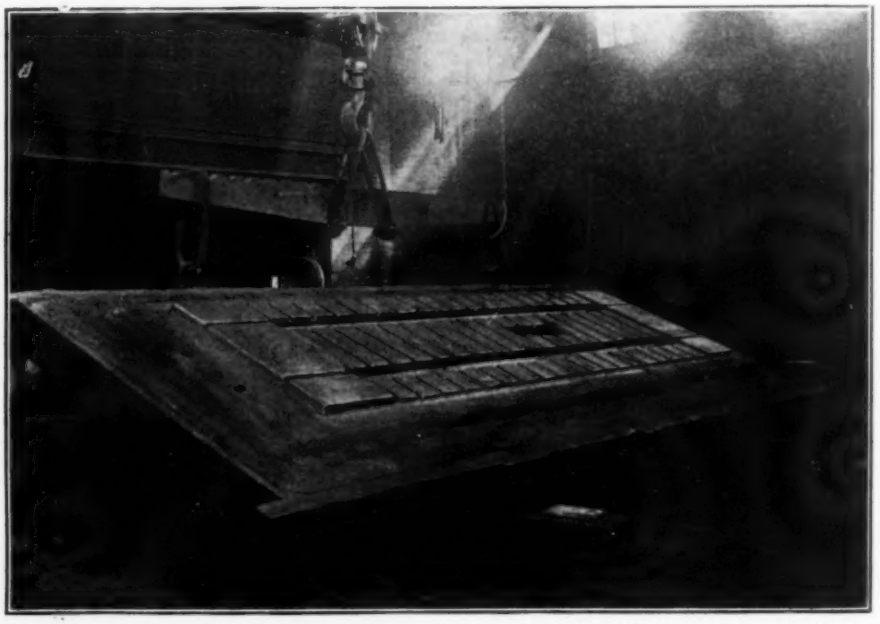


FIG. 6—COPE WITH FACE REPAIRED

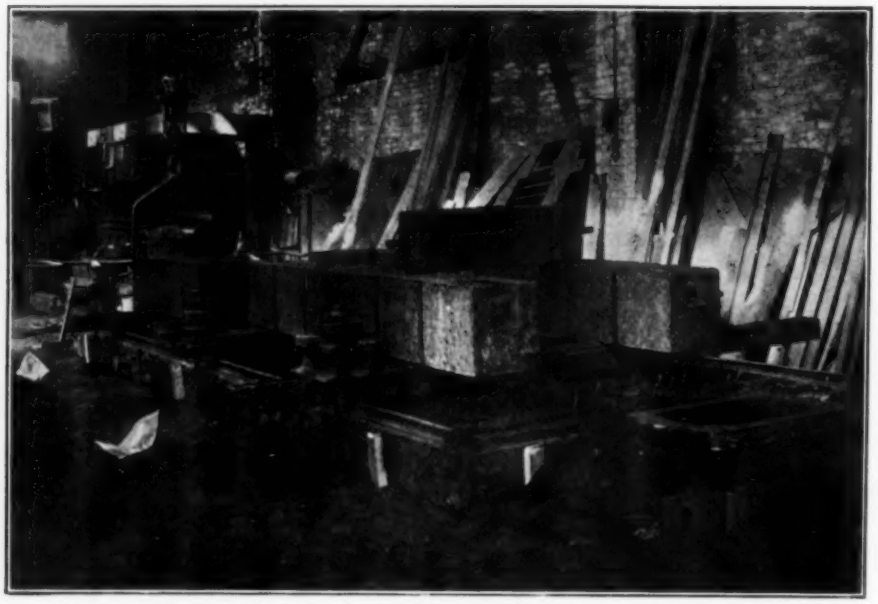


FIG. 5—THE COPE IS HELD DOWN WITH WEIGHTS AND BINDERS AND THE METAL IS POURED THROUGH TWO POURING BASINS

Channels at *A* and *B* respectively in the right and left side of the mold shown in Fig. 7 permit the molten iron to flow into that part of the mold forming the table instead of forcing it to flow over the top of the projecting body of sand. These channels also serve to distribute the iron uniformly so that it rises evenly all over the surface and eliminates danger from cross currents and from having a higher level of iron in one part of the mold than another.

Cover Surface Rapidly

Large mold surfaces should be covered with metal as rapidly as possible. In the illustration Fig. 7 it will be noted that four gates *C* are provided at each end and Fig. 5 shows that two ladles were employed, one at each end, to pour the casting. A stream of iron flowing over green sand cores will cause them to scab and cold shuts will develop on large plain surfaces that are not covered rapidly. This is particularly true in castings of comparatively heavy section since usually the phosphorus and silicon contents are lower, and the pouring temperature is lower than in castings of lighter section. For the foregoing reasons gates and communicating channels are provided on a generous scale. The mold as it appeared ready for pouring is shown in Fig. 5.

The condition of the mold shown in Figs. 4 and 8 requires a word or two of comment. It is apparent that a considerable part of the molder's time will be required to make up all the broken corners so that the finished face will appear as in Fig. 6. Patterns that are passed from one jobbing foundry to another are subject to rough and careless handling. The molder who makes the job is not particularly careful since he never may be called upon to make a second casting from the same pattern. However, in many cases of this kind a considerable part of the trouble may be traced back to the pattern shop where the faces of ribs and other vertical faces are made at exact right angles to the body of the pattern when they might just as well be generously drafted.

Probably so long as patterns are made by one class of workmen and molded by a second class, differences of opinion will prevail on the method of construction and subsequent handling. The patternmaker will claim that if the pattern is given proper care it will last indefinitely and the last casting made from it will involve no more work on the molder's part than the first. The molder will claim that even a perfect wood pattern, molded under the most favorable conditions, will deteriorate in the foundry in a comparatively short time. Patternmakers devote time to useless embellishment and refinement of finish rather than to features that will facilitate the work of the molder. The foregoing applies in some measure to all patterns but more particularly to large patterns which involve a considerable amount of inevitable hand finishing on the mold. In many places it is customary to omit corner fillets on certain parts of the patterns. The corners are marked in a suitable manner, usually by omitting to shellac them when going over the remainder of the pattern, and the molder forms the fillet in the sand while engaged in finishing the mold. In the great majority of cases corners must be hand tooled or patched by the molder and therefore a fillet on the pattern is of no benefit.

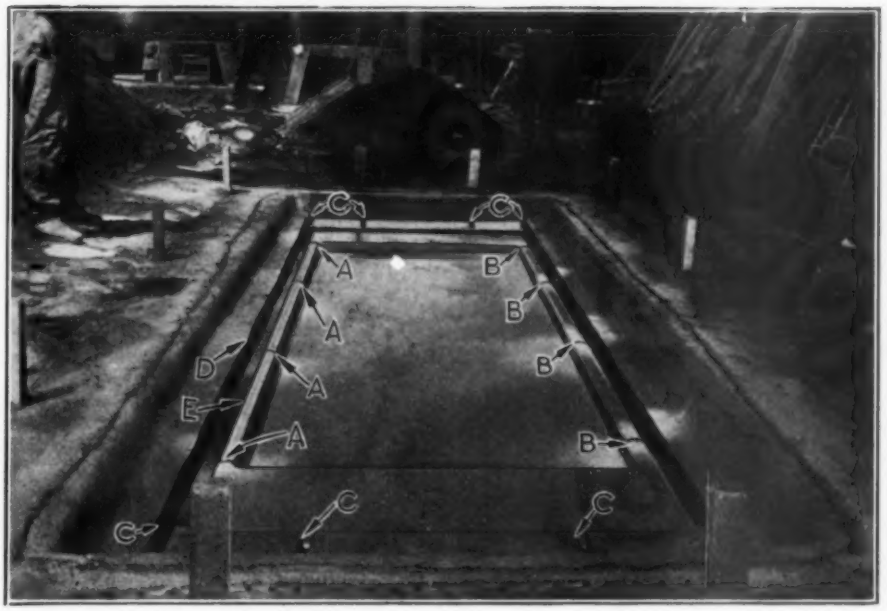
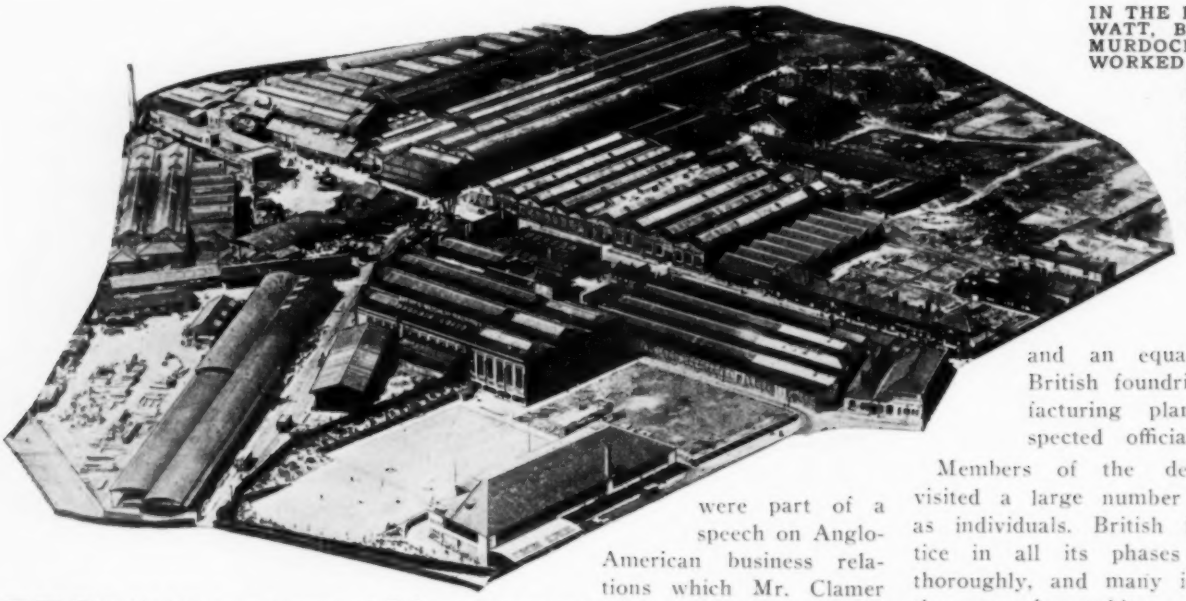


FIG. 7—FOUR GATES ARE CUT AT EACH END—IN ADDITION AUXILIARY GATES ARE CUT AT *A* AND *B* TO INSURE A UNIFORM FLOW OF IRON OVER THE ENTIRE SURFACE

The big steel foundry at the Watertown arsenal, Watertown, Mass., is soon to be closed according to report from the war department. Every effort has been made to secure orders for castings from other government departments but nothing of a nature which would warrant keeping the steel foundry in operation has developed. The work of the ordnance department of the army has gradually fallen off until at present operations are almost entirely composed of experimental models.

FIG. 8—COPE SHOWN AFTER BEING ROLLED BACK FOR FINISHING

End Tour of British Centers



IN THE PLACE WHERE WATT, BOULTON AND MURDOCK LIVED AND WORKED HAS GROWN AN EXTENSIVE PLANT DEVOTED TO THE MANUFACTURE OF WEIGHING, TESTING AND COUNTING MACHINES. W. & T. AVERY, LTD.

WE HAVE long known of Britain's greatness; now we have felt it. We are amazed at your commerical and industrial strength especially the development of your foundry and metal industries, which is exceeded only by the warmth of your welcome." In these words, G. H. Clamer, president of the American Foundrymen's association, expressed the feelings of the delegation of American foundrymen who have just completed a 17-day tour of England, prior to going to Paris for the international foundrymen's congress. The American party was guest of the Institute of British Foundrymen, the British Iron and Steel institute, and the National Iron Founding Employers' federation. The remarks just quoted were part of a speech on Anglo-American business relations which Mr. Clamer delivered at Sheffield on Aug. 29, in the midst of the tour of the A. F. A. delegation The visit to England commenced with the arrival of the LEVIATHAN at Southampton early Friday afternoon, Aug. 24, and concluded with the departure from London of the special train carrying representatives of the American and British foundrymen's association to the Paris convention, at 2.00 p. m., Sept. 11.

Visit English Cities

In the interim the American party visited London, Sheffield, Manchester, Birmingham, and Coventry, with side trips to the Peak district, the Dukeries, Chester, and the Shakespear country. An even dozen official luncheons and dinners were tendered the visitors and an equal number of British foundries and manufacturing plants were inspected officially.

Members of the delegation also visited a large number of foundries as individuals. British foundry practice in all its phases was studied thoroughly, and many ideas, such as the use of graphite washes on the surfaces of steel molds, were picked up, which will later be tried out under American conditions. Several practical foundrymen who are members of the delegation have declared that the new ideas and points of view on foundry problems acquired during the trip have alone been worth all the expense and time. In addition, a large number of personal connections have been established which undoubtedly will endure for a long time and considerably augment the interchange of information.

When the American delegation finally assembled in London, it included 50 persons. The main party of 26 sailed from New York on the United States Liner LEVIATHAN on Aug. 18

OFFICIALS OF HADFIELDS, LTD., AND MEMBERS OF THE A. F. A. DELEGATION AT THE HADFIELD PLANT, SHEFFIELD, ENGLAND, AUG. 29, 1923

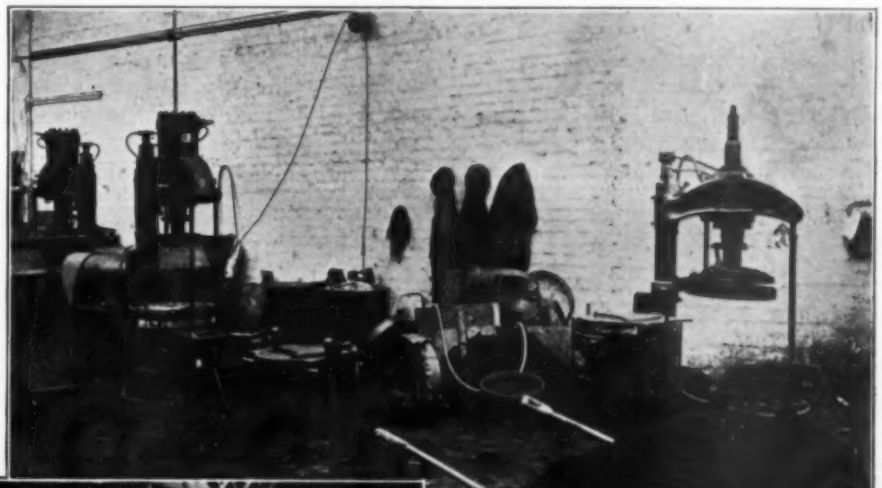
and arrived at Southampton five days later after one of the fastest transatlantic voyages since the war. Other members of the party traveled independently, some having left America as early as July 1. The party was headed by G. H. Clamer, Ajax Metal Co., Philadelphia, president of the A. F. A.; V. E. Minich, American Foundry Equipment Co., New York, a director of the association; Stanley G. Flagg Jr., Stanley G. Flagg & Co., Philadelphia., past president and vice chairman of the committee on international relations; Dr. Richard Moldenke, honorary member; H. Cole Estep, chairman, committee on international relations; and C. E. Hoyt, secretary treasurer.

Immediately after the arrival of the party in London an informal reception was held at the Hotel Cecil on Saturday morning Aug. 25, at which the Institute of British Foundrymen and the British Iron and Steel institute were represented by Col. W. F. Cheesewright, publisher, *Iron and Coal Trades Review*, London, and Mrs. Cheesewright; F. J. Cook, Rudge-Littley, Ltd., Birmingham; Wesley Lambert, J. Stone & Co. London, and Mrs. Lambert; V. C. Faulkner, editor, *Foundry Trade Journal*, London, and Mrs. Faulkner; W. G. Hollinworth, secretary, Institute of British Foundrymen; G. C. Lloyd, secretary, Iron and Steel institute; and H. J. Meybury, Magnesium Co. Ltd., London, and Mrs. Meybury.

After lunch, the program of excursions was appropriately commenced by a motor trip to Windsor, where by special arrangement with the Lord Chamberlain all the state apartments of the castle were visited. The visitors were particularly interested in the numerous specimens of old cast-iron cannon which may be seen at Windsor castle. Before returning to London tea was served at the ancient White Hart hotel. A brief address of welcome was made by V. C. Faulkner, president of the London branch of the I. B. F.

The pattern of international comradeship among foundrymen," said Mr. Faulkner, "is made in three parts, representing the United States, Great Britian, and our continental allies, France and Belgium. From this pattern on the occasion of this first visit of an American delegation, we hope before you return home to cast our friendship in such permanent form that it will last several generations."

On Monday, Aug. 27, the gentlemen of the party were taken to the Charlton plant of J. Stone & Co., nonferrous metal founders and manufacturers, where they were received by S. E. Presitige, works director, Wesley Lambert, metallurgical director, H. G. Clavering, and others. This plant is devoted principally to the manufacture of manganese-bronze steamship propellors of all sizes, up to over 20 feet in diameter. The molds are swept up in loam and dried. The metal is carefully mixed in crucibles holding about 280 pounds each and remelted for casting in coal-fired reverberatory furnaces, the propellors after pouring being frequently fed for several hours with liquid metal to overcome liquid contraction.



MOLDING MACHINES ARE EXTENSIVELY EMPLOYED AND THE LATEST SCIENTIIC AIDS TO PRODUCTION ARE NOTED IN BRITISH SHOPS

LIGHT AND MEDIUM WEIGHT CASTINGS AND THAT CLASS OF WORK WHICH THE BRITISH TERM MASS PRODUCTION ARE MACHINE MOLDED

After the visit to the Stone foundry lunch was served at the old Ship hotel, subsequent to which visits were paid to the painted hall and Nelson room of the Royal Naval college at Greenwich, and to Greenwich park and the observatory. At the luncheon, Mr. Lambert gave interesting details of the history of Greenwich, after which a vote of thanks was proposed by V. E. Minich, American Foundry Equipment Co., New York, and seconded by Jesse L. Jones, Westinghouse Electric & Mfg. Co., Pittsburgh. Mr. Minich said, "We are extremely grateful for the courtesy of our British friends, which we accept not as a tribute to ourselves, but to the

great foundrymen's organization we represent, and the lasting friendship between our two countries."

The London visit concluded with an official dinner at the Hotel Cecil, Monday evening, Aug. 27, to which all the members of the American delegation were invited. Wesley Lambert, retiring president of the London branch, I. B. F., was chairman. In opening the proceedings Mr. Lambert paid a feeling tribute to the late President Harding.

In the principal address of the evening, Sir Robert Hadfield, chairman, Hadfields, Ltd., Sheffield, representing the council of the Iron and Steel institute, paid glowing tributes to the work being done by prominent members of the Amercian foundrymen's association for the foundrymen of the world, mentioning specifically C. H. Clamer, president, John A. Penton, Richard Moldenke, Stanley G. Flagg Jr., Walter Wood, Enrique Touceda, and John Howe Hall. In expressing the regret of British foundrymen at the passing of Dr. H. M. Howe, Capt. Robert W. Hunt, and President Harding, Sir Robert said, "It seems to me that if these two nations share their feelings in time of sorrow, it is very evident that in times of opposite nature we must also go hand in hand. In conclusion, Sir Robert gave his listeners some exceedingly interesting information concerning the membership of Benjamin Franklin in the Royal Society of Great Britain, which awarded him the Copley medal in 1753, admitted him as a fellow in 1756, and was instrumental in his addressing the house of commons in 1766. "It is fitting," said Sir Robert, "that G. H. Clamer, president of the A. F. A., should also be such a prominent member of that great American scientific academy, the Franklin institute."

Sir Roberts remarks were ably seconded by Engineer Vice-Admiral Sir George Goodwin, president of the Institute of Marine Engineers, Who spoke of the work done by Americans in applying science to foundry practice.

G. H. Calmer, president of the American Foundrymen's association, replying to the toast, said that the extreme good fellowship now existing between American and British foundrymen was due largely to the contact established in 1919 by A. O. Backert, then president of the A. F. A. "It is because of his visit to you at that time," said Mr. Clamer, "cemented so ably by the return visits of your president and past presidents, Oliver Stubbs, T. H. Firth, and F. J. Cook last year, that we have become acquainted, and that we come here not as strangers but as friends." Mr. Clamer is a member of all three organizations represented at the London dinner, the American Foundrymen's association, the Institute of British Foundrymen, and the Iron and Steel institute. He mentioned the award by the Franklin institute of the Elliott Cresson gold medal to Sir Robert Hadfield, and referred in glowing terms to the extraordinary scientific attainments of its recipient. "A nation," said Mr. Clamer in conclusion, "is nothing more than a great business organization, and just as business men have learned the advantages of co-operation in place of cut-throat competition, so must nations. And to cement this co-operation we are looking forward to holding an international foundrymen's convention in the United States, at the first mutually convenient opportunity."

Oliver Stubbs, president I. B. F., said he heartily endorsed Mr. Clamer's remarks, adding that present day unrest could be settled if business men would only assert themselves and control the activities of politicians.

SOME EXCEPTIONALLY LARGE FOUNDRIES WERE NOTED—THIS SHOP COVERS MORE THAN SEVEN ACRES OF FLOOR SPACE

"The Ladies," was proposed by Col. W. F. Cheesewright, and responded to by Miss J. M. V. Aynesley, the only woman member of the I. B. F. "The Chairman," was proposed by V. E. Minich.

A 10-day tour of the industrial centers of England commenced on Tuesday afternoon, Aug. 28, when the American delegation left London for Sheffield in a special car attached to the afternoon express on the Midland railway. Members of the London reception committee accompanied the party to the St. Pancras railway station. They were greeted on arrival

at Sheffield by prominent members of the Sheffield branch of the I. B. F. including T. H. Firth, Wicker Iron Works, past president I. B. F.; J. Shaw, Brightside Foundry & Engineering Works, president Sheffield branch I. B. F.; W. A. Macdonald, Wicker Iron Works, secretary, Sheffield branch, I. B. F.; G. Ernest Wells, Edgar Allen & Co, Ltd., formerly director of castings production, ministry of munitions of war; John R. Hyde, Robert Hyde & Sons, Ltd., and others.

On Wednesday, Aug. 29, visits were paid to the East Hecla plant of Hadfield's Ltd., and to the foundry of Edgar Allen & Co., Ltd., lunch being served at the former plant and tea at the latter. These inspection trips gave the American visitors an excellent opportunity to study British steel foundry practice. The East Hecla plant includes what is believed to be the largest foundry under one roof in the world, the building covering seven acres. Altogether the Hadfield company has over 14 acres of foundries. The Edgar Allen works is almost equally large. The latter is noted for its sand handling and preparing facilities and the efficient arrangement of its various departments. In both plants the visitors were impressed by the great attention paid to surface finish, as well as converters and open hearth furnaces, but G. Ernest Wells explained the relative backwardness of British electric furnace development by pointing out that it is usually necessary in England to work with a basic lining and do considerable refining in the electric furnace, on account of the relative paucity of low-sulphur, low-phosphorus scrap.

At the luncheon at Hadfields, Ltd., it was announced that P. B. Brown, managing director, recently had been elected a member of the ancient Cutler's company of Sheffield. In seconding the toast to the American foundry industry, proposed by Sir Robert Hadfield, chairman, Mr. Brown said that America leads in the application of science to the foundry trade, but that England is still pre-eminent in the art, and is also now giving great attention to the scientific side of metallurgical problems. In a brief response, Mr. Clamer referred to the invention of manganese steel and to the efforts of Drs. Wall and Green of the Franklin institute, in which he participated, to make a carbonless ferromanganese. After the luncheon the guests were entertained by motion pictures of the Hadfield plant including views of the recent visit of the Prince of Wales.

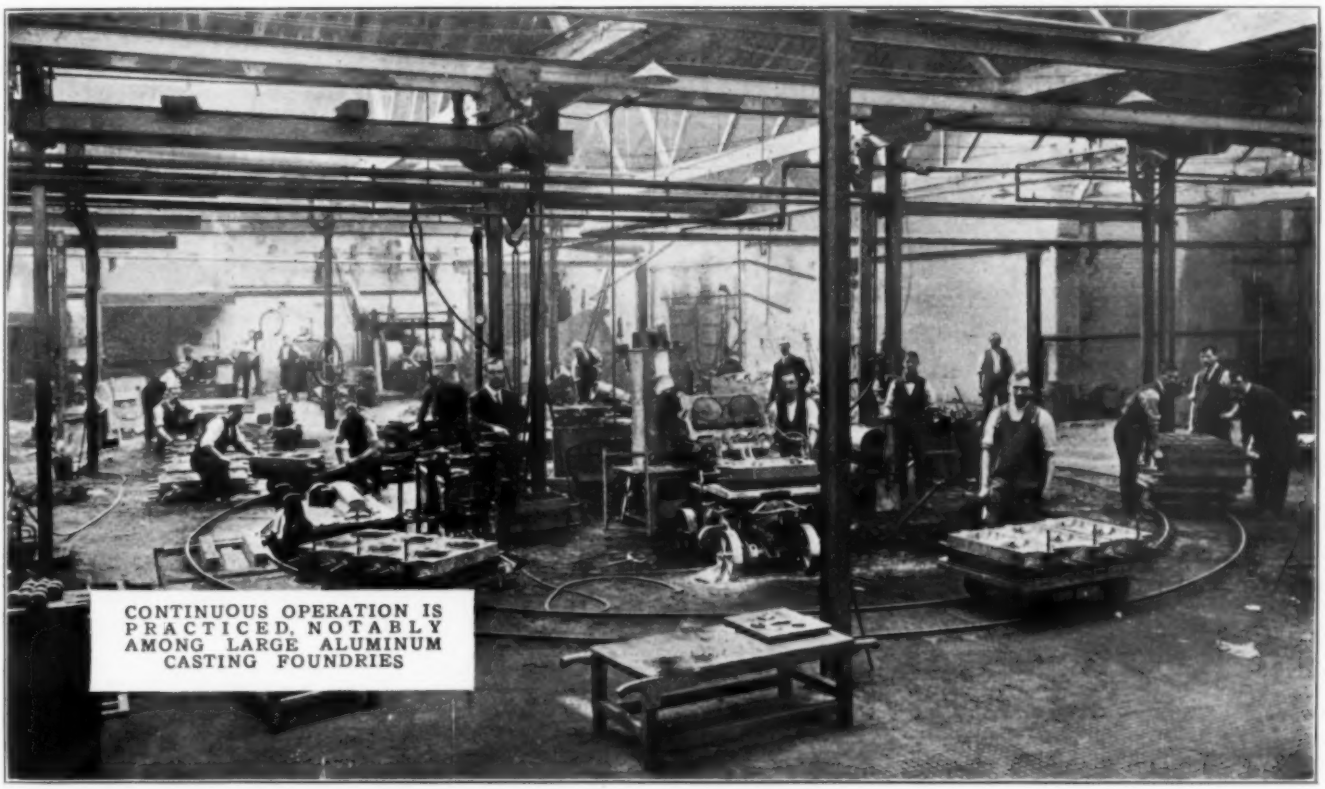
At a dinner given to the American delegation at the Royal Victoria hotel, Wednesday evening, Aug. 29, John Shaw, president of the Sheffield branch of the Institute of British Foundrymen, occupied the chair.

The principal toast to the guests was again proposed by Sir Robert Hadfield. In tracing the development of steel foundry practice from the days of the crucible he paid a tribute to the work of the American Foundrymen's association in introducing science into castings manufacture. As a result of this, he said, steel foundry losses which in his early experience in Sheffield were 50 per cent or more, have now been reduced to 10 per cent or less. He told how locomotive wheel centers, which are now cast steel, were first made of welded wrought-iron bars. At present cast steel of 65,000 pounds tensile strength and 25 to 30 per cent elongation is common, and in addition it is possible to cast armor plate which is still ductile with a tensile strength of over 125,000 pounds per square inch.

"Pittsburgh," said Mr. Clamer, in reply, "is the Sheffield of America."

V. E. Minich, director of the American Foundrymen's association, in proposing "The City and Commerce of Sheffield," to which the Lord Mayor, W. C. Fenton, replied, pointed out the diversity of the industries of Sheffield, as well as their worldwide fame and said Americans are endeavoring to emulate the policy of Sheffield manufacturers of producing good wares, or none at all.

Dr. Richard Moldenke, in proposing the toast to the Institute of British Foundrymen, spoke of the important work being done by the several branches of the association. He made a plea for greater international co-operation for the maintenance of high standards of quality through the adoption of international specifications for pig iron, and iron and steel castings.



CONTINUOUS OPERATION IS PRACTICED, NOTABLY AMONG LARGE ALUMINUM CASTING FOUNDRIES

Thomas H. Firth, who responded, paid a warm tribute to the American foundryman. He recommended the enrollment of more American-born boys as apprentices in the foundries of the United States. "Teach your own boys molding, as we do here," he said, "instead of so many foreigners."

Thursday, Aug. 30, was devoted to a sightseeing trip to Haddon Hall and other beauty spots in the Sheffield district. After informal visits to local shops on Friday morning, Aug. 31, the party departed for Manchester in the afternoon. Arriving at the cotton city, they were met by Oliver Stubbs, president of the Institute of British Foundrymen; R. A. Miles, president, Lancashire branch, I. B. F.; T. Makemson, secretary, Lancashire branch; E. H. Broughall, Coventry, junior vice president, I. B. F., and others.

HEAVY ROLLS FORM ONLY ONE LINE OF THE BRIGHTSIDE FOUNDRY & ENGINEERING WORKS, SHEFFIELD

Dr. Richard Moldenke, Watchung, N. J., delivered two addresses during the English tour covering interesting features of American foundry practice. Both were largely attended. The first, under the auspices of the Sheffield branch of the I. B. F., was given at Sheffield on Friday evening, Aug. 31, with J. Shaw, branch president, in the chair. The second, before the Lancashire branch, was delivered at the College of Technology, Manchester, Saturday afternoon, Sept. 1. R. A. Miles, president of the Lancashire branch, occupied the chair.

Over one hundred prominent representatives of the British foundry industry welcomed the American delegation at dinner at the Midland hotel, Manchester, Friday evening, Aug. 31. This dinner was given by the National Ironfounding Employers' federation of which Oliver Stubbs is president. Mr. Stubbs occupied the chair. In welcoming the guests he read telegrams of good will from Emile Ramas, president, Association Technique de Fonderie de France; Joseph Leonard, president, Association Technique de Fonderie de Liege; C. E. Hoyt, secretary-treasurer, American Foundrymen's association, Chicago; John A. Penton and A. O. Backert. Mr. Stubbs pointed out that the greatest need of the world's industry at the present time is peace. It is said that it is perhaps significant that practically the only portions of the earth's surface where a real peace prevails today are those under the American and British flags. "Anglo-American co-operation," he said, "can make this beneficient condition worldwide." Mr. Stubb's remarks were supported by F. J. Taylor. Replying for the American Foundrymen's association, G. H. Clamer, complimented the National Ironfounding Employers' federation on the excellent organization it has created for dealing with the business problems of foundrymen in Great Britain.

The toast of the "City and Commerce of Manchester" was proposed by Walter Wood, R. D. Wood & Co., Philadelphia. In the absence of the Lord Mayor, W. Cundiff, G. Longbottom, chairman of the engineering section of the Manchester Chamber of Commerce, made a graceful reply "The engineers of England," he said, "attach enormous importance to international gatherings of prominent men because through co-operation will come stabilization and later a real peace in the world." The dinner was accompanied by a program of instrumental and vocal music. It marked a high tide in the A. F. A. delegation's visit to England.

AN ABUNDANT SUPPLY OF SKILLED MOLDING LABOR IS AVAILABLE FOR HEAVY HIGH GRADE CASTINGS

Following the dinner three busy days were spent in the Manchester district. Saturday morning, Sept. 1, was devoted to an excursion to points of interest in the vicinity of Manchester. On Sunday, Sept. 2, the delegation was again the guests of the National Ironfounding Employers' federation and Mr. Stubbs on an excursion to the ancient walled city of Chester where luncheon was served followed by a trip on the river and concluded with a dinner at the Gros-

venor hotel on the return to Chester.

On Monday, Sept. 3, the American visitors were the guests of the Lancashire branch of the Institute of British Foundrymen. The afternoon was spent in inspecting the plant of the Metropolitan-Vickers Electrical Co., formerly the British Westinghouse Co. at Trafford Park. This plant, on account of its adaptation of American methods to British conditions, was especially interesting.

The visit to the Metropolitan-Vickers plant was followed by a high tea at the Victoria hotel, Manchester, at which R. A. Miles, president of the Lancashire branch, occupied the chair. A theater party was given in the evening.

On arrival in Birmingham the delegation was met by prominent members of the Birmingham branch. Wednesday morning, Sept. 5, the foundry of W. & T. Avery, Ltd., was visited. In addition to the modern foundry practice exhibited, this plant was especially interesting because it was once owned by Boulton & Watt, and made many of the castings for James Watt's original steam engines. After luncheon the new foundry of the Birmingham Aluminum Co. at Smethwick, was inspected. This is one of the largest nonferrous plants in Europe. The visitors had an opportunity to examine various details of die-casting practice including methods of casting large pieces such as automobile crank cases.

The plant of the Midland Motor Cylinder Co. also was visited at Birmingham, where an opportunity was afforded to study British methods of casting automobile cylinders. A new oil-fired reverberatory furnace was melting cylinder iron instead of the ordinary cupola. It is of the tilting type and melts down a cold charge of 2 tons in two hours. About 15 per cent steel is used in the mixture. The purpose of the furnace is to obtain an iron with the lowest possible total carbon consistent with machinable gray iron. Sample heats have analyzed 2.70 per cent total carbon with 2.25 per cent silicon. The test bars are said to show 42,000 pounds per square inch tensile strength.

A complimentary dinner was given by the Birmingham branch Wednesday evening, Sept. 3, at the Queen's hotel. Prof. Thomas Turner, Birmingham university, occupied the chair, and proposed the toast to the President of the United States. G. H. Clamer proposed the King.

In his address on "The City of Birmingham and the Foundry Industry," V. E. Minich referred to the important part played by men of the Birmingham district, such as Professor Turner and F. J. Cook, in developing of the scientific side of the foundry business. He referred to the bond of sympathy which exists between these leaders and their American contemporaries such as Enrique Touceda, Dr. Richard Moldenke and the late Thomas D. West and W. J. Keep. The presence at the dinner of intimate relatives of Thomas D. West, including his wife and son, Ralph West was mentioned. The Lord Mayor of Birmingham, David Davis, responded to Mr. Minich's toast.

G. C. Vyle, managing director, W. & T. Avery, Ltd., and president of the Birmingham Chamber of Commerce, proposed to the health of the visitors, to which Jesse L. Jones, Westinghouse Electric & Mfg. Co., Pittsburgh, and past president, American Institute of Metals, responded.

Thursday, Sept. 6, was spent visiting important plants in the Coventry district, luncheon being served by the Coventry branch of the Institute of British Foundrymen at the Masonic hall. The plants visited included those of the Daimler Co., British Piston Ring Co., and Sterling Metals Co. The visitors were thus able to inspect centrifugal casting methods and other interesting details of British foundry practice connected with the automobile industry. The ladies participated in the visit to Coventry. At Birmingham on Wednesday they were taken in private cars to the Cadbury chocolate works and to the Worcester Porcelain factory. Tea was served at Worcester.

After touring the Shakespeare country, Sept. 7, the delegation returned to London where they were entertained on Monday, Sept. 10, by the officials and directors of the shipping, engineering and machinery exhibition at the Olympia pavilion. The entire afternoon was spent in inspecting the numerous displays of machinery at the exhibition.

The party was joined in London by C. E. Hoyt, secretary-treasurer of the American Foundrymen's association, who arrived at Plymouth on the GEORGE WASHINGTON, Sept. 9. Tuesday afternoon, Sept. 11, accompanied by 100 members of the Institute of British Foundrymen, the American delegation left for Paris on a special train.

British Hosts

THE Institute of British Foundrymen marshalled many of its leading members and leading English business men to welcome the American delegation on its tour through Great Britain. A partial list of the official hosts is as follows:

London branch—V. C. Faulkner, president; Wesley Lambert, past president; Colonel W. F. Cheesewright, member of council; W. G. Hollinworth, general secretary; Sir Robert Hadfield, member of council Iron and Steel Institute; G. C. Lloyd, secretary Iron and Steel Institute.

Sheffield branch—James Shaw, *president; T. H. Firth, past president; W. A. MacDonald, secretary; Sir Robert Hadfield; G. Ernest Wells; John R. Hyde; P. B. Brown.*

Lancashire branch—Oliver Stubbs, president Institute of British Foundrymen; R. A. Miles, president Lancashire branch; T. Makemson, secretary; G. Longbottom, chamber of commerce.

Birmingham branch—J. B. Johnson, president; F. J. Cook, past president; H. Roe, secretary; Gibert Vyle, chamber of commerce; the Lord Mayor of Birmingham; Prof. Thomas Turner; Sir Herbert Austin.

Coventry branch—C. Dicken, president; J. M. Meston, secretary; E. Carey Hill; the deputy Lord Mayor of Coventry; E. H. Broughall, vice president, Institute of British Foundrymen; T. F. Tickner.

Propose Iron Analysis

IN conjunction with the visit of the American Foundrymen's association to England, a movement has been started to revise the grading of British pig iron for export. As already reported by cable, negotiations in connection with this question are being conducted by Dr. Richard Moldenke, Watchung, N. J., and Walter Wood, R. D. Wood & Co., Philadelphia, acting in their official capacity as chairman and vice chairman respectively of committee A-3 on cast iron, of the American Society for Testing Materials. Dr. Moldenke and Mr. Wood also are acting informally for the American Foundrymen's association under the advice of the president, G. H. Clamer.

As previously reported a circular recommending the proposed classification is being distributed to leading British manufacturers of pig iron through the

Recommended Specifications For Pig Iron

In the year 1906, the American Society for Testing Materials found it desirable to frame recommendations for the supply of pig iron on analysis, in view of a pressing need that had developed. In 1913, the International Association for Testing Materials framed proposals to extend the above practice so that it would be applicable to international trade. In 1923, the convention of the American Society for Testing Materials framed a carefully made revision of the specifications of 1906, which corresponds to the American practice that has developed during the intervening years. The cast iron division of that society has empowered its officers to present the following for discussion before the iron-masters of Great Britain and the continent:—

I—MANUFACTURE

The pig iron shall be clean, as free as possible from an excessive amount of dross and sand, and may be either sand or machine cast.

II—CHEMICAL PROPERTIES

(*a*)—The pig iron shall conform to the chemical requirements specified by the purchaser at the time of purchase, with the following permissible variations from the specified percentages in the case of pig iron intended for the manufacture of gray iron castings:

Silicon	0.25 per cent above and below
Sulphur	Not over specified percentage
Phosphorus	0.15 per cent above and below
Manganese	0.20 per cent above and below
Total carbon	Not less than specified percentage

(*b*)—In the case of pig iron for making steel, malleable iron or special castings, a maximum percentage of phosphorus and either a maximum or minimum percentage of manganese may be specified.

III—SAMPLING AND ANALYSIS

(*a*)—In sampling, each carload (or its equivalent), shall be considered as a unit.

(*b*)—One pig shall be taken to every 4 tons in the car, and they shall be chosen from different parts of the car as to secure, as nearly as possible, a sample representing the average quality of the iron.

(*c*)—The pigs thus taken shall be sampled by drilling, so as to fairly represent the composition of the pigs as cast.

(*d*)—An equal weight of the drillings from each pig shall be thoroughly mixed to make up the sample for analysis.

IV—INSPECTION AND REJECTION

In case of dispute, the sampling and analysis shall be made by an independent chemist, mutually agreed upon (if practicable, at the time the contract is made), whose decision shall be final. The cost of such resampling and reanalysis shall be borne by the party in error.

All pig iron which fails to conform to these specifications shall be subject to rejection.

APPENDIX

In using these specifications it is not advised that all five elements be specified in all contracts for pig iron, but it is recommended that, when these elements are specified, the following percentages be used, and for convenience the accompanying telegraph code is endorsed:

Total Carbon		Silicon	
Per cent	Code	Per cent	Code
3.00	Ca	1.00	La
3.20	Ce	1.50	Le
3.40	Ci	2.00	Li
3.60	Co	2.50	Lo
3.80	Cu	3.00	Lu
		3.50	Ly
(Minimum)		(0.25 allowed either way)	

Sulphur		Phosphorus		Manganese	
Per cent	Code	Per cent	Code	Per cent	Code
0.04	Sa	0.20	Pa	0.20	Ma
0.05	Se	0.40	Pe	0.40	Me
0.06	Si	0.60	Pi	0.60	Mi
0.07	So	0.80	Po	0.80	Mo
0.08	Su	1.00	Pu	1.00	Mu
0.09	Sy	1.25	Py	1.25	My
0.10	Sh	1.50	Ph	1.50	Mh
(Maximum)		(0.15 allowed either way)		(0.20 allowed either way)	

Illustration of the use of above coding: The word Ii-se-ca-mo-pi indicates silicon 2 per cent; sulphur, 0.05 per cent; carbon, 3 per cent; manganese, 0.80 per cent; phosphorus 0.60 per cent, with variations as allowed.

Percentages of any element specified halfway between the above shall be designed by the addition of the letter X to the next lower symbol.

Example: PeX indicates phosphorus 0.50 per cent, with allowed variations of 0.15 per cent up and down.

DR. RICHARD MOLDENKE
WALTER WOOD

For American Society for Testing Materials

To

MR. ARTHUR DORMAN, President
National Federation Iron and Steel Manufacturers.

agency of the National Federation of Iron and Steel manufacturers. This proposed classification, of course, has no reference to the grading of British pig iron for the domestic market, but it is believed that should it be adopted for export it would facilitate the sale of British pig iron in the United States. Details of the proposed classification as submitted by the American Society for Testing Materials are given in the accompanying table.

Seeks To Raise the Malleable Standard

A special circular has been issued by the British Cast Iron Research association urging the British producers of malleable iron to follow the example of the American Malleable Castings association in raising the general standard of their product and in convincing the railroads and automobile manufacturers of the advantages of using malleable. That a high grade malleable iron is being made in Great Britain is said to be indicated by a test of iron made by one firm, which showed a tensile strength of 56,700 pounds per square inch and an elongation of 14 per cent in 2 inches.

Centennial Brings New Comparisons

Occasionally historical facts are vividly pictured by incidents which make startling revelations. The *Sheffield Independent*, Sheffield, England, reproduced as a matter of interest an advertisement on August 23, 1923 which it had originally published August 23, 1823. It reads as follows:

Workmen wanted—Smiths and stove grate fitters of sober habits apply to Scott, Chambers & Co., Thorncliffe Ironworks, near Sheffield.

Several workmen, failing to read the entire article sent in replies to the advertisements, a few insisting that they had never touched beer in their lives.

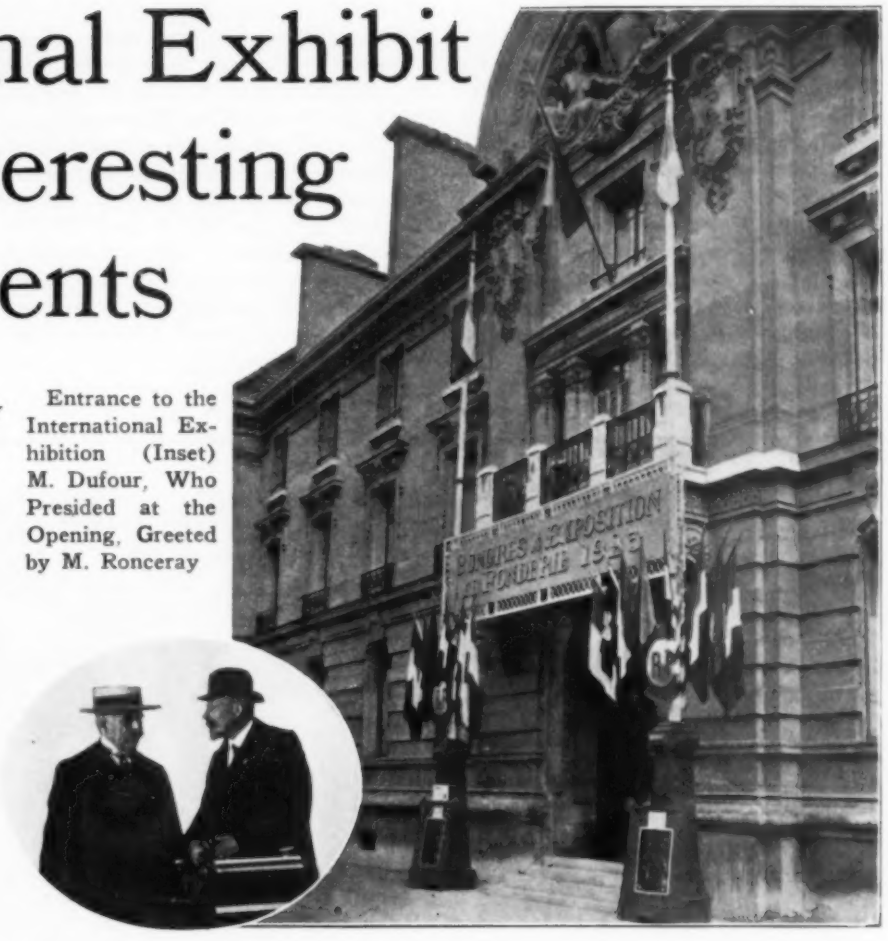
The point of interest in the anecdote is the fact that the newspaper and the Thorncliffe ironworks have traversed 100 years together, and the stability and unusual want of changes manifested seems to indicate that, however rapid the progress of industry the relative change in a century is small. The newspaper still publishes advertisements; the ironworks still offers employment; the required smiths and stove-grate fitters still are found. It serves to indicate also the relatively small change in the nature of the products manufactured as the ironworks still produces stove grates and still employs smiths, but in this day to work on structural steelwork, unknown a century ago.

Hear About Pig Iron

High sulphur content in pig iron is not necessarily detrimental to pig iron for foundry use according to George A. Richardson of the Bethlehem Steel Co., who gave an illustrated talk at the first fall meeting of the New England Foundrymen's association, Sept. 12 at the Exchange club, Boston. Mr. Richardson gave an illustrated description of the mining and transportation of iron ore, and the smelting of pig iron and its use in the cupola. An unusually large attendance of foundrymen listened with interest to the paper and many joined in an active discussion of points raised by the speaker.

International Exhibit Shows Interesting Developments

BY VINCENT DELPORT
French Representative, THE FOUNDRY



Entrance to the International Exhibition (Inset) M. Dufour, Who Presided at the Opening, Greeted by M. Ronceray

THE first international exhibition of foundry equipment and supplies opened in Paris, France, September 2, in connection with the third conference of the Association Technique de Fonderie de France, Sept 12-15. Papers from France, Belgium, Great Britain, Czecho-Slovakia and the United States were read. This combined meeting was proposed at the convention of the Institute of British Foundrymen held in Birmingham in June 1922, by E. V. Ronceray, one of the pioneers and originators of the Association Technique de Fonderie de France.

The French Foundrymen's association was created in 1911; its first conference and exhibition took place at Nancy in 1913, but owing to the interruption caused by the war the second meeting did not take place until October, 1922. At present the society numbers nearly 400 members and achieved a marked success in the organization of the international meeting.

The exhibition was installed in the three courtyards of the Ecole Nationale des Arts et Metiers of Paris, one of the leading French practical and technical engineering schools. This institution operates a complete foundry shop which was opened to visitors during the sessions.

The exhibition was opened by M. G. Dufour, President of the Syndicat General des Fondeurs de France, assisted by M. E. Ramas, president of the Association Technique de Fonderie, and Mr. Corre, director of the school and representative of the ministry of technical education, a representative of the ministry of Commerce was also present. Over 70 exhibits were displayed, mostly by French manufacturers, but with the United States, Great Britain, Belgium and Italy also represented.

Along the center of the main court-

A. F. A. Delegation in Attendance at Paris

C. E. BELL, president, C. S. Bell Co., Hillsboro, O.

E. W. CAMPION, Buckeye Steel Castings Co., Columbus, O.; member A. F. A. committee on steel castings.

G. H. CLAMER, first vice president and general manager, Ajax Metal Co., Philadelphia; *president, A. F. A.*

MRS. CLAMER, MISS CLAMER.

W. E. DUNN JR., secretary, Southern Metal Trades association, Atlanta, Ga.

H. COLE ESTEP, THE FOUNDRY, London.

C. EARNILL, assistant superintendent, Fay & Scott, Dexter, Me., and Copenhagen, Denmark.

STANLEY G. FLAGG JR., Stanley G. Flagg & Co., Inc., Philadelphia, past president, A. F. A.

C. H. GALE, 1418 West Eighty-fourth street, Cleveland.

C. S. GILBERT, superintendent, Canada Iron Foundries, St. Thomas, Ont.

MRS. GILBERT.

JOHN HILL, Hill & Griffith Co., Cincinnati.

MRS. HILL.

C. E. HOYT, *secretary, A. F. A.*, Chicago.

JESSE L. JONES, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., past president, Institute of Metals; member A. F. A. committee on papers and molding sand research.

G. W. KNOTTS, United Engineering & Foundry Co., Youngstown, O.

MRS. KNOTTS.

GEORGE H. KRAMER, Kramer Bros. Foundry Co., Dayton, O.

PETER J. KRENTZ, vice president, Buffalo Foundry & Machine Co., Buffalo.

MRS. KRENTZ.

H. M. LANE, H. M. Lane Co., Detroit.

L. S. LEHMANN, S. B. Sexton Stove & Mfg. Co., Baltimore.

JAMES LINKLATER, superintendent, Michigan Malleable Iron Co., Detroit.

J. S. McCORMICK, president, J. S. McCormick Co., Pittsburgh.

MRS. McCORMICK, MISS McCORMICK, MASTER McCORMICK.

WILLIAM R. MARTIN, American Steel Foundries, Chicago.

VERNE E. MINICH, American Foundry Equipment Co., 366 Madison avenue, New York, *Director, A. F. A.*

MRS. MINICH.

DR. R. MOLDENKE, Watchung, N. J.; secretary A. F. A. 1900-1914.

MRS. MOLDENKE.

W. H. NICHOLLS, W. H. Nicholls Co., Inc., 2-10 College place, Brooklyn.

Q. S. SNYDER, vice president, Pittsburgh Rolls Corp., Pittsburgh.

R. E. TURNBULL, Arcade Mfg. Co., Chicago.

MRS. TURNBULL.

GEORGE WADSWORTH, president, Wadsworth Core Machine Co., Akron, O.

RALPH WEST, West Steel Castings Co., Cleveland.

MRS. R. WEST and MRS. M. WEST.

W. S. WHITE, J. S. White Co., Pawtucket, R. I.

WALTER WOOD, R. D. Wood & Co., 400 Chestnut street, Philadelphia. Representing the committee of A. F. A. dealing with international specifications for cast iron.

M. W. ZEMAN, sales manager, Osborn Mfg. Co., Cleveland.

yard, elaborate foundry machinery was in operation, while on both sides of this court, equipment and supplies were exhibited. Castings of all description also were exhibited, these overflowing in both the smaller courts where the educational section and a group of artistic castings were placed.

Among the most interesting displays were various types of molding machines, pig-breaking devices, sand preparing and sand-blast appliances. These exhibits bore evidence that France is coming forward in the use and manufacture of foundry machinery; urged by the necessity of conserving manpower and reducing production costs.

It is interesting to note that some French foundrymen still maintain that squeezer machines are preferable to jolt-ramming machines, and also appear to incline toward a more intensive use of hydraulic power. However, representatives of American manufacturers state that the sales of jolt-ramming machines in France gradually is increasing.

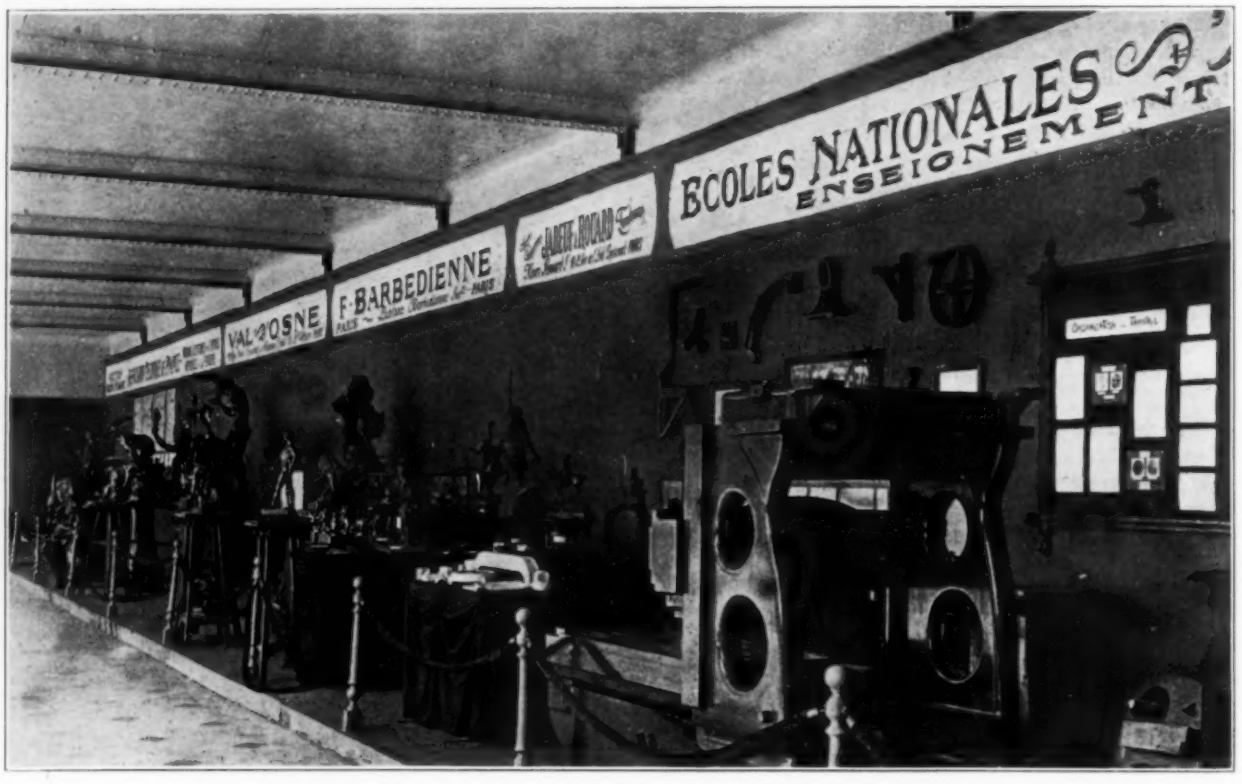
The exhibit of Ph. Bonvillain & E. Roceray, Choisyle-Roy and Paris, France, reflected the former viewpoint. This firm showed a new hydraulic jolting machine, the patents of which still are pending. The valves of this machine, are opened by a small sewing machine motor. The control is easy and the stroke of the table may be varied from a tremble to violent impact blows, to suit the class of work to be done. One machine can lift about 700 pounds, while another can lift 4500 pounds.

A re-designed rollover machine made by the firm mentioned, for deep molds was operating during the exhibition on the drag side of a British standard axle box. In conjunction with this machine, another re-designed type of machine was working on the shallow side of the mold. The latter is fitted with an arrangement permitting several jolts to be made before the squeezing is commenced. A high-speed, hydraulic-squeezer, molding machine also was shown by Bonvillain & Ronceray. This is said to produce from 300 to 400 complete molds per day. It rams the top and bottom molds simultaneously, withdraws the pattern plate, closes the mold on the machine and eventually pushes the mold completely through the flasks thus enabling the same flasks to be used repeatedly. Other machinery exhibited by this firm included: A horizontal pump for working hydraulic machines, and accumulators working at 750 pounds to the square inch; an assembling machine for closing the molds and pushing them through the flasks; a vertical desintegrator; a new machine where the usual rods are replaced by carpenter nails; a core sand mixer; a rotary portable sieve and a new self-emptying sandmill. In the latter apparatus, the sand enters the center of the machine and is discharged on a circular groove from which it is swept and finally discharged in an opening leading to a sand disintegrator, making the working of the sand entirely automatic from the moment it is fed into the machine until it is discharged into buckets.

In the educational section this same firm exhibited a testing machine for transverse testing and a testing machine for shearing tests, both of the Fremont type; also an apparatus for controlling the ramming of molds and an apparatus for controlling the permeability of molds.

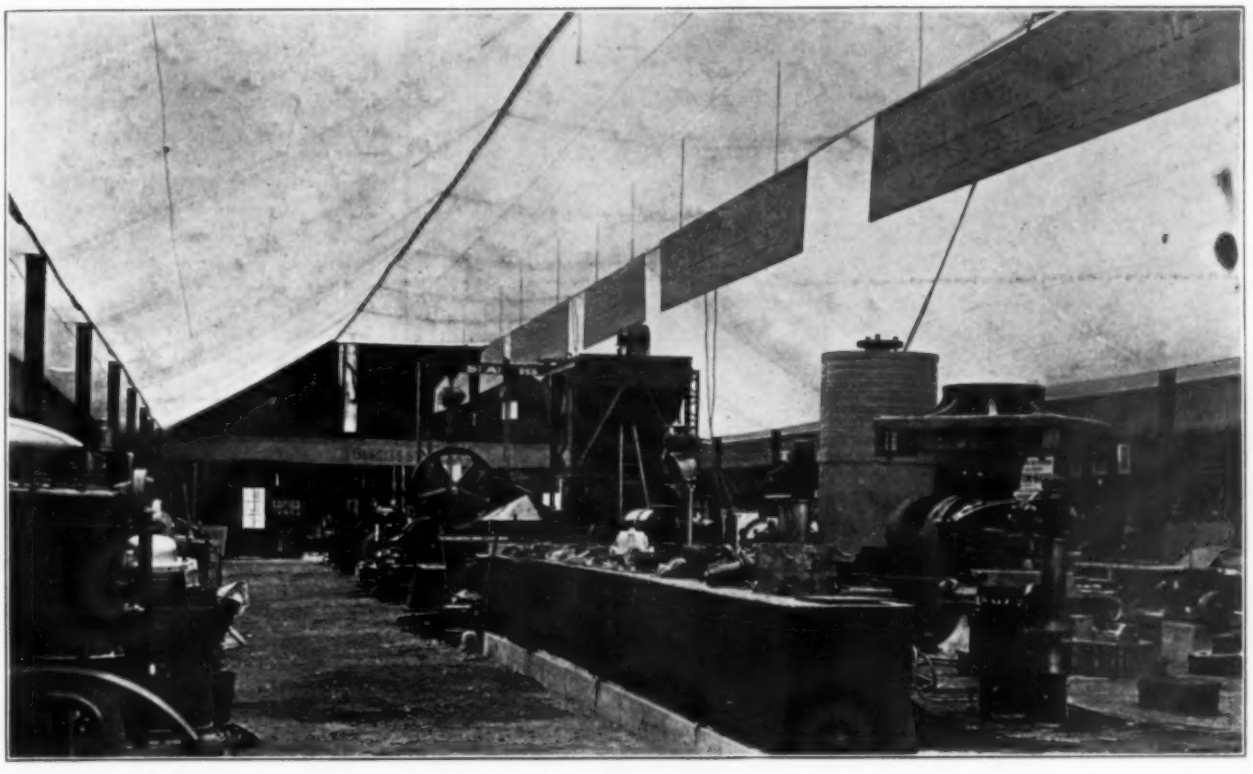
Grally Freres & Co., Charleville, France, exhibited an hydraulic-squeezer, molding machine on which two half molds of 11 x 19 inches can be made at the same time. The squeezing head may be rolled back on rollers when not in use. The machine is fitted with a pattern-drawing device. One single lever is sufficient to operate the machine which weighs about 200 pounds.

Hand operated, squeezer, molding machines were displayed by Etablissement Marillier, Saint Loup sur Semeuse, France, which showed a machine specially designed for molding saucepans,



Artistic Castings and Educational Displays Lined the Corridors

and which is said to produce 20 molds an hour. The Societe des Etablissements A. Utard displayed hand-operated molding machines. Plain squeezers mounted on swinging arms which may be used with stripping plates, or on rollover types for deeper molds. A group of two machines specially designed for large production of iron pots was in operation. A rollover type for the drag and which is also specially effective for core molding, and a new underneath squeezer for the cope also were shown. These machines are adaptable for light and medium work, and are said to make



American and European Machinery Was Shown in Full Operation

240 molds, 14 inches in diameter and 8 inches deep in 8 hours, the time including molding, pouring and shaking out. Alfred Baillot & Co., Saint Ouen, near Paris, showed hand operated molding machines, hydraulic squeezer machines two sand mills and other sand preparing devices, and an electric fan on ball bearings for cupolas.

American molding machines were well represented. The Osborn Mfg. Co., Cleveland, through their agents in France, the Allied Machinery Co. showed among other exhibits a jolt-squeezer, stripping-plate, molding machine of new design, an improved, direct-draw, rollover, jolt machine and a standard, direct-draw rollover, jolt-squeezer molding machine. This display which was under direction of M. W. Zeman, sales manager of the machine division of the Osborn company, included a number of other standard machines familiar to the American foundrymen. J. W. Jackman & Co., Ltd., representatives in England for the Osborn Mfg. Co. were represented at the Paris show.

The S. A. Anciens Etablissements Glaenzer & Perreaud which holds the French license to manufacture and sell molding machines for the Wm. H. Nicholls Co., Inc., Brooklyn, N. Y. showed a combination jolt squeeze machine with a hand-operated rollover device; a combination jolt squeeze machine, two combination jolt squeezers with stripping device, one of similar type with a magnetic pattern drawing appliance and a plain jolt ramming machine. Other equipment shown by Glaenzer & Perreaud included a rotary sieve, a wheelbarrow sieve, a sand mixer and a sand grinder.

Molding machines made by the Tabor Mfg. Co., Philadelphia, were exhibited by Fenwick Freres & Co., Paris, who showed a portable, combination, jolt, rollover machine with pattern drawing device, one jolt, power, squeeze, split-pattern machine, one split pattern machine, one power squeezing machine and one plain jarring stripping-plate molding machine. The same firm exhibited a core machine made by the Tabor Company, plain jolt ramming and an air-operated core machine made by Wm. Demmler & Bros. of Kewanee, Ill. A standard core machine made by Wm. American Foundry Equipment Co. New York and a number of pneumatic tools made by the Independent Pneumatic Tool Co., Chicago were shown, together with air compressors, hoists, trucks and electric apparatus almost all of American manufacture.

Among the American exhibitors was the Penton Publishing Co., which displayed its publications, including THE FOUNDRY, *Iron Trade Review*, *Abrasive Industry*, and other periodicals, together with its technical books. Series of photographs illustrating American foundry practice also were shown at the booth maintained by this company.

The Etablissements A. Sisson-Lehmann, Charleville, Ardennes, France, displayed a sand-blast automatic apparatus by which five to ten tons of castings may be cleaned daily.

Among other exhibits by the Etablissements Sisson-Lehmann were cast iron flasks for machine molding, the walls of which are only ¼ inch thick and backed by a rib which renders the flasks rigid.

The Societe Parisienne de Materiel de Fonderie showed various type of sieves and sand mixers, two grinding mills

were displayed, one of which is patented by that firm. Core machines and core ovens also are manufactured and were displayed by this firm.

Ladles of all sizes were displayed by Emile Degremont, le Cateau, France. A sand grinding machine shown by Gernelle-Danly & Co. Rouen, presented curiously grooved reels to assist in aërating the sand. Sand blast apparatus and ladles were also shown by S. A. Anciens Etablissements Ladreyt, Clichy, near Paris. The Societe de Construction Moderne showed a sand preparing display composed of an elevator, a reel grinding and mixing machine and a removable device for airing the sand; each part may be operated independently if needed. This firm also exhibited a device for gathering the sparks at the top of cupolas. Air blowers were displayed by the Compagnie de Fabrication de Compteurs et Materiel Pour Usines a Gaz who showed also fans constructed under the patent of H. P. & F. M. Roots Co., Connersville, Ind.

Small Tools and Supplies Demonstrated

Molders' Tools Displayed

Lardin & Co. displayed complete sets of molder's tools, a specialty formerly made entirely in Germany, but now manufactured in France. The Etablissements Henry Hamelle, Paris, showed samples of white metal and a special alloy for foundry patterns which is characterized by its small shrinkage. Guillet Fils & Co., Paris, showed various types of woodworking machines designed especially for the pattern shop. Montupet & Co., Paris showed an interesting exhibit of aluminum castings, including automobile parts in light alloys, some containing magnesium and especially designed for airplane motors.

Heavy castings were displayed by Societe Metallurgique de Gorcy of which M. Ramas, of the French foundry association is president. These castings were mainly cast iron wheels and chill cast rolls. The Fonderies et Atelieres de Nord-Paris showed a steel casting of a gun carriage for heavy artillery which was a remarkable piece of work. Delattre et Frouard, Nancy also showed rolling mill cast iron machinery. Fives-Lille and Marine et Homecourt displayed heavy castings such as tuyeres and rolling mill housings, and the latter firm showed samples of phosphorus pig. Les Fils de A. Piat & Co., Paris, showed molded gear wheels. Acieries Reunies de Burbach-Eich-Dudelange also displayed molded gear wheels and other heavy castings. Valves, pipe fittings and pipe were shown by Societe Metallurgique du Perigord.

A booth was specially arranged for demonstrations of arc welding given by Societe la Soudure Autogene, Paris. Pig iron samples were displayed by the Belgian and British concerns. The Belgian Societe Ougree-Marihaye showed chill-cast rolls. One Italian firm, the S A. Materiali Refratteri, displayed a number of crucibles. In one of the side courtyards were exhibited artistic castings, such as statues, urns, etc., by Societe du Val d' Osne, F. Barbedienne and Jabeuf et Rouard.

Schools Exhibit Castings

The Ecoles Nationales des Arts et Matiers, six in number and which include the school which sheltered the exhibition, displayed a number of patterns and castings executed by the students in the school shops. The Association Technique de Fonderie de Liege also showed exhibits of their educational work. A number of competitions were organized among foremen, molders, apprentices and students. Part of the competitions consisted in the making of castings, patterns, cores, etc., the best of which were displayed; the other part consisted of papers on foundry problems, the most interesting subject being the study of the various small phenomena which happen in molds. Prizes were awarded to the best results and answers.

It has been announced that a special foundry school will be established to operate in January 1924. This school is organized by the Syndicate General des Fondeurs de France and will be patronized by the government.

Photographs and Publications Showed American Practice

C. D. Hollins, formerly connected with the Black Products Co. as sales manager, is now in charge of the sales department for the National Engineering Co. of Chicago, manufacturer of Simpson foundry sand mixing equipment. Mr. Hollins has had considerable experience in foundry work.

Reports American View on Bar

International Test Bar Considered from American Standpoint and a Resume Given of Development of the Standard Gray-Iron Test Bar in United States with History of Changes Adopted

BY RICHARD MOLDENKE

THE procedure of testing iron castings is a difficult matter because of the nature of the material itself. Instead of dealing with a relatively homogeneous material, as is the case with steel and nonferrous metals and alloys, we have in cast iron a combination consisting of solutions and suspensions in iron of iron carbides, silicides, sulphides and phosphides, as well as manganese carbide and sulphide. And in addition to all these there is more or less graphite in mechanical admixture. Further, the proportions of chemically combined carbon and mechanically admixed graphite present vary in every piece of cast iron from surface to center, the extent of this variation depending upon a number of factors connected with the composition and the rate of change from high to low temperatures. There is little wonder that with such a material to test for its qualities and adaptabilities, progress has been slow and tempered with caution.

None the less, there is a genuine desire on the part of both producers and consumers of the foundry product to know as much as possible of the character and value of the castings before they get into actual service. For many lines of castings the purchaser is content with the reputation of the foundry selected for excellence of product, and were all foundries able and content to turn out only the best of work, there would be little need of specifications. But for the protection of the consumer, as well as the insurance of the foundryman himself, it is highly desirable to have simple but still reliable methods of testing which will insure excellence in quality in iron castings where this is of sufficient importance to warrant the additional trouble and expense involved.

Seldom Test Castings

A study of the history and development of the subject shows that the testing of the castings themselves is resorted to in but few instances, for it is necessary to subject them to forces which may cause their actual destruction. Where such a test is intended to destroy the piece, a few castings are selected from a given carefully collected group made under identical conditions, and these castings are destroyed under tension, pressure, shock or thermal treatment, and the results are required to exceed certain minima. The chilled iron car wheel is probably the best example of this method of testing finished work.

For other lines of castings which are to stand given service stresses well within the limits of resistance of the material, the individual finished piece is subjected to such stresses in the test room to the extent of 50 or 100 per cent above the maximum required in service. Pipe fittings, parts of mechanisms and structures, separately or in assembled state, are thus tested to give reasonable assurance of their fitness for the work demanded of them. Even the proof test required of the old cast-iron cannon would come under this category.

Test of Casting Not Practicable

But with every desire to test the actual casting, this is not always practicable and often is misleading. Apart from the unhomogeneity of the metal in the casting, there are the casting strains, interior shrinkages, surface cracks as starting points of rupture, and other irregularities in the physical structure, which must be cared for by large factors of safety embodied in the design, and which make one almost despair of arriving at any safe conclusion from tests of any kind.

The next development seems to be the cutting out of sections of metal from catsings and testing these for their qualities. Usually the sound portions of otherwise defective castings are selected for this purpose and test coupons cut from them. The idea is logical enough, and in the case of homogeneous material that has been left in a natural state by final annealing, gives acceptable results. Steel forgings are tested thus, and in the case of malleable and steel castings coupons are sometimes cut from unessential parts when regular test bars are unavailable. However, when this is tried with gray-iron castings it becomes a different matter.

Perhaps the most interesting development of the method of judging a casting by small test pieces cut directly from it, is that of Fremont. Here a hollow drill removes small cores of metal from selected parts of the casting, and these small rods are subsequently prepared for shearing tests. With all the ingenuity involved in working out this method and the comparative accuracy obtained in the relation of shearing to tension forces for every individual test, the fatal objection is that these cores of metal represent only themselves and not the other parts of the casting. The cores cannot be taken from portions of the casting directly stressed in service, but usually come from the heavier portions and where no damage is done by the operation. Considering the fact that a test core taken close to the surface of a 6-inch cube may be three times as strong as when taken from the center, the care and cost of the method would seem expended in vain so far as the desired results are concerned. Were a casting reasonably homogeneous from surface to center, and were there no strains or shrinks to contend with, the Fremont method would be nearly ideal from the scientific standpoint, though rather expensive.

The crystallization of ideas in connection with the testing of cast iron finally brought out the preparation of test bars made with the same iron as the castings, and the subjection of such test bars to proof loads. Some of the older foundrymen may still remember the casting of bars 1-inch square in section and long enough to place upon supports 5 feet apart. A load of 500 pounds was then carefully lowered for suspension at the middle. Rupture of this bar, whether at once or overnight, according to the specification, would condemn the castings.

Bases Modern Procedure

Crude as this method was, it yet formed the beginning of modern procedure in testing the foundry product. The fundamental idea involved, and which must be carefully kept in mind at all times, is that test bars do not represent the castings made of the same iron, but only the quality of the iron going into these castings. Hence the supreme importance of giving the iron poured

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into test bars every opportunity to solidify in a natural way, with neither artificial strengthening, nor hindrance from attaining full normal strength. The requisites for these conditions are discussed later. It may be noted that this test bar procedure still involves a deference to the reputation of foundrymen for the quality of their work, for with ever so good an iron to pour into the molds for castings, it can be injuriously affected by poor molding and injudicious gating practices.

Complications Arise

The advent of a separately cast test bar soon brought about complications between buyer and seller, for human nature in the foundry is just as prone to take advantage of opportunities for substituting bars of stronger iron in place of bars from the regular output, as it is prone to make the buyer believe that all bars he does not himself see cast are spurious. Hence the desire to attach test bars to the castings as part of the mold. This means a much shorter bar. This method is to some extent in use today, particularly where government work is involved and business with foundries is conducted at long range. For cast iron, it makes a difference in the results whether the coupon bar is placed at the top, middle, or bottom of the mold; whether strains are present from this attachment; and whether the annealing action of the usually large and long-continued heat transfers from the attached heavy metal masses will not affect the test results unduly. Also it is difficult to retain the coupon intact on the casting through the various processes of shaking out, cleaning and transportation. It is to be hoped that foundrymen eventually will be spared the molding of coupon test bars, which in addition to being highly troublesome are made under technically unreliable conditions.

As the separately cast test bars began to come into general use, the cumbersome lengths were reduced to test at 3 feet, then 2 feet, as still used today in the standard cast iron pipe test bars. Finally the length was reduced to the present American bar which is placed upon supports one foot apart and broken transversely. Tensile test pieces always were made short and saw an evolution from square, flat, or round pieces about one foot long, gripped by the flat wedges of the testing machine, to the carefully turned test pieces of the present time made from the broken halves of the arbitration bar and provided with threaded ends, so that alignment in the testing machine may be as nearly perfect as possible before and during test.

In the early days of the test bar a variety of shapes were used. The square bar predominated, usually 1 inch square in section, though for years the ½-inch square section held its vogue in the light castings shops. The round bar of today, for transverse testing, was practically unknown at first, and came into use after many series of tests had been made by early investigators. This change and simplification of the test bar situation was concomitant with the advance in knowledge of the physical and chemical properties of cast iron, and as this information grew in extent more or less elaborate investigations into the subject were instituted by foundry and engineering bodies the world over. These led to the publication of the results of many testing programs. The most complete of these ever made, and the last conducted in the United States, was that of the American Foundrymen's association. The tests covered a period of years, from 1898 to 1900. The writer of this report was chairman of the committee having the matter in charge. The tests involved the pouring of tons of bars of many kinds of iron under the best of foundry conditions. The results were studied by committees of the American Foundrymen's association and the American Society for Testing Materials jointly, and form the basis of the specifications now in use. The leading foundrymen and metallurgists of the United States at that time were members of these committees, and they evolved definite lines of procedure which are still standard today, and are used where buyer and seller clash in specification contracts.

Not to Replace Individual Bar

Be it understood that the American standard arbitration test bar never has, nor ever will replace the test bars used in individual foundries that are loath to change their old ways or individual preferences. But for universal comparison of results it is essential that a standard be adopted with which all other bars can be corelated by suitable factors. A national standard may even consist of several bars of different cross-sections to care for an extended silicon range and thus cover a wider field in lines of castings than a single bar; but when it comes to an international standard, it would seem essential that but one bar be selected which would cover the metal going into castings used for machinery and pieces of construction, rather than to include such special work as chilled rolls, crusher parts, or the very lightest and thinnest castings in which strength is not essential.

Among the separately cast test bars once much affected was the *ring test*, in which an annular casting was made of the same iron that was used for the work under consideration. This ring was practically a piece of heavy pipe of short length. From this ring a test bar was planed out longitudinally and tested for tensile strength. In effect, this was an almost flat bar with the four hard corners removed. Doubtless, the irregularity of the metal at the fracture through interior shrinkages must have caused the abandonment of the method.

Advanced by Two Societies

The American arbitration test bar, and the method of preparing and testing it, as first advanced by the two societies previously mentioned, in 1905, has proved satisfactory to the present day in every respect but its length. When first advanced, the method was ahead of the time. However, the foundry industry has slowly worked up to it and the arbitration bar is specified for general as well as specific lines of castings, to judge the quality of the metal going into the product.

The American foundrymen and engineers now are ready to consider the lengthening of the bar, and possibly increasing the diameter somewhat at the same time. However, they will be glad to await international action on this point so that when an international arbitration test bar is adopted, this may possibly be acceptable as the American national standard bar.

That the reasoning by which the present American test bar was worked out may be fully understood, the following summary of the arguments used is given.

The cast-iron pipe industry announced at the outset that they would retain their standard test bar. It is the same bar as used in Great Britain, namely 1 x 2 inches in section and 26 inches long. It is tested on supports 24 inches apart. The bar is placed flat, in American, and on edge in British testing. This bar has the advantage of approaching the general distribution of metal in cast-iron pipe. It is long and exhibits elasticity under test. The disadvantage of the bar is the fact that it has four hard edges and is softer in the center, as in square bars. Such a bar sliced longitudinally into three sections of equal width will show widely different metal in middle and end pieces. It is to be hoped that when an international standard bar is agreed upon, that this will be long and flexible enough to replace the antiquated flat cast-iron pipe bar which does not effectively register serious differences in chemical composition or different pig-scrap relations for equal compositions.

The disadvantages with the flat section are those of the square section. On comparison of test results of square

bars with round ones of equal sectional area, the former will always be found stronger. This is because of the greater proportion of combined carbon in the iron at the four edges which cool more rapidly than the other sections of the bar. Therefore, the metal in a square bar is not under as natural a condition of setting and cooling as it is in a round one. Consequently the round section was determined upon as a matter of basic principle in the American standard. In fact, it might be stated that about the only advantage a square bar has is that it rests better upon the test supports, and the outer fiber of the metal tears along a line rather than at a point.

Round Bar Has Disadvantages

The disadvantages of the round bar are the concentration of the maximum fiber stress on the lower point of the fracture circle, and the inconvenience of the test piece for transverse testing. The decisive advantage of the round section bar is the uniform change in the character of the metal from the center of the bar to every point on the periphery of the fracture circle.

On the questions of length and diameter of the American standard arbitration bar the following can be said. At the time of the adoption of the bar practically every one in America who made bars at all, outside of the cast-iron pipe interests, used a length which allowed a transverse breaking test on supports 12 inches apart. Therefore, the bars varied from 13 to 15 inches in length. The question of studying the deflections had not assumed any particular importance at that time, as the stronger irons, made with steel additions to the mixtures, had made their appearance only sporadically. However, with the general use of steel scrap in mixtures, giving a line of castings going under the misnomer *semisteel*, the measure of the resilience of cast iron became of interest, and there is a desire manifest for a longer bar which would exhibit deflections that can be differentiated and would mean something. Incidentally, the incorrectness, scientifically, of the term *semisteel*, and the fact that it is used for commercial advantage covering all kinds of steel scrap mixtures has become generally recognized in America, and hence through the agency of the American Society for Testing Materials there has been advanced the term *high-test* cast iron, for want of a better designation, and tentative specifications for this material are pending at present. These, when adopted as standard, will differentiate between ordinary cast iron of good quality and the new varieties of much higher strength obtained by the use of high percentages of steel scrap in the mixtures.

The length of an international bar probably will be a matter of compromise as nations using short bars will yield on some increase, just as nations using extremely long bars will agree to a shortening. The International Association for Testing Materials had proposed an international test bar with dimensions which would be readily convertible in English and metric measurements. It was to be tested on supports 18 inches, or 45 centimeters apart. The bar itself was to be at least 20 inches, or 50 centimeters long, to give the essential length for testing in case of short pouring the mold. From the reports of testing bodies of the more interested nations this bar length seems generally acceptable, and it is suggested as a basis for discussion when this matter of an international test bar is taken up seriously for settlement.

The question of diameter of the test bar is a matter that may require some further study on the part of the interested foundrymen and engineers of the world. The bar originally proposed was to be 1.2 inches, or 30 millimeters in diameter. Many of us have made numerous tests with a bar of this diameter broken on supports 18 inches apart. The curves obtained from these transverse tests on irons of a variety of compositions are not altogether satisfactory and indicate that the bar is too flexible for its length. Might it not be well to first agree upon the shape of the cross section and the length of the bar as broken upon supports for test, and then make a study of the desirable diameter of such a bar. The diameter decided upon should give the bar proper degree of sensitiveness to deflection. This thought is advanced for the reason that all the other points involved in the selection of an international bar should lend themselves to a ready adjustment, whereas the most advantageous diameter or section for a bar to be broken on supports 18 inches apart has not yet been evolved by systematic study.

Deciding Section of Bar

The following are the facts, upon which the diameter of 1.25 inches for the American arbitration bars were based. It was recognized that the smaller the section, the more the bar would be influenced by sand and temperature conditions. Hence a bar as large as possible was selected which would still give results well within the scope of the usual commercial testing machines in use. As the load maximum for the common American machines is 5000 pounds, and the 1.25-inch diameter bar, broken on supports 12 inches apart, would fall between 2500 and 4500 pounds for practically all classes of iron, this diameter was fixed upon. Extending the test supports to 18 inches would allow a considerably thicker bar for the international standard and still be within the scope of the testing machines generally used in America.

The question of machining the test bars comes up now and then. For the tensile test this is obligatory, as accuracy in alignment is the *sine qua non*, otherwise the results are worthless. However, in the case of the bar for transverse test, American thought never has favored machining even if this does remove fine surface cracks that might become the starting points for premature rupture. Machining is not favored because of the considerable expense involved; because a reasonable under or oversize readily can be corrected to bring the results corresponding to standard; and because machining removes the most sensitive part of the bar, for nowhere is the change from high to low combined carbon more rapid in cast iron than right at the skin. With the considerable machining necessary in an extra large bar, the character of the iron in the outer fiber receiving maximum stress would be far different from that in the standard sized bar.

Different Results Obtained

Should bars be cast flat or on end (vertical)? It is a well-known fact that unless a bar cast flat is tested in the same position; that is, with the cope side up, the result will be different from that obtained if the bar had been turned around; that is, cope side down. This is realized when one considers what happens to the bottom mold surface, which is heated more and longer by the stream of molten metal poured upon it than the top. The character of the iron at the top and at the bottom of the bar necessarily must be somewhat different. This is the case even if the mold is inclined. To avoid all chances of error the American arbitration bars are cast in the vertical position and consequently can be tested without regard to top or bottom. The making of a mold which when set up vertical and poured off will give a perfect test bar is not a simple matter, and the first bars turned out by an inexperienced man will look like iron clubs rather than castings of uniform thickness. However, when one has seen bars such as are made in cast-iron pipe shops, 26 inches long, poured by the thousand in a vertical position and come out satisfactorily, he concludes it is simply a question of proper flasks and molding skill.

The results of all the testing programs carried out show that green-sand

bars are stronger than those made in dry sand. Hence, to avoid any question of artificially strength in the iron in test bars by the chilling effect of damp sand, the molds should be dried and allowed to acquire room temperature before being poured.

Some difference of opinion exists on the subject of bottom or top pouring the test bars. Perhaps to understand the situation easily, molds that are poured in each of these two ways should be observed. When top pouring bars are in a vertical position the temperature of the molten iron falling into and filling the mold from the bottom upward will be exactly the same for all parts of the bar, with metal at maximum temperature continuously available for feeding just where it is required. Whereas, with the bottom-pour method the metal at highest temperature enters the bottom of the mold by a gate and filling up to form the test bar is cooled off considerably, as is easily seen by comparing the color of the molten metal in the riser with that of the pouring basin. Naturally, this colder metal sets before the hotter iron lower down in the test bar, and as the thin gate at the bottom also sets before the molten iron in the bottom portion of the

(*Continued on Page* 806)

Finished Seats Are Cast Inside Valves

BY DON PARTRIDGE

AFTER a series of experiments the Greene-Schaw Co., Berkeley, Cal., has succeeded in developing a process for casting gray iron valve bodies around previously machined seats. The company has patents pending on a unique line of valves designed for the control of

FIG. 1—FINISHED CORE WITH THE VALVE SEAT RING IN PLACE

either water or oil. One of the peculiar features of the valve is that the seat is inaccessible to machining. Furthermore the seat cannot be secured in position either by threading or bolting. The only practical remaining method is to first prepare the valve seat, place it in the valve mold and pour the casting around it in such a manner as to lock the seat ring accurately in place. The method by which this is accomplished is shown in Fig. 1. A sectional view of the assembled valve is shown in Fig. 2.

The ring is ground perfectly clean and then what is destined to be the upper or seat side is finished on a disc grinder to provide a clean smooth surface for the reception of the valve flapper. The ring is placed in a recess in the corebox and is rammed and dried as an integral part of the core. The finished surface remains bedded in the sand forming the core, but the outer rim projects into the mold cavity and is surrounded by the molten iron which anchors it firmly in place upon solidification.

The mechanical features of the problem presented no particular difficulty but considerable trouble was experienced in devising a method to prevent distortion of the ring, cracking, either of the ring or the body; and leakage at the joint between the ring and the other part of the casting. These largely have been overcome.

The first two features of the problem were solved by properly proportioning the weights of the rings, the extent of ring surface in contact with the body, and the metal thickness of the metal in the body surrounding the ring. No exact rule has been worked out for determining these proportions but it is known that the ideal combination is one in which a sufficient ring surface in proportion to the volume of metal in the ring is exposed to the fluid iron to insure heating the entire ring to a bright red before the metal in the body freezes. Thus by the time the body begins to contract the ring has expanded to its limit and the two contract uniformly. Danger of cracking or distortion is eliminated. As a precautionary measure the valves are immersed in a salammoniac solution to effectually seal the joint.

A 500-pound capacity electric furnace made by the Greene Electric Furnace Co., Seattle, Wash., is employed for making both iron and steel castings.

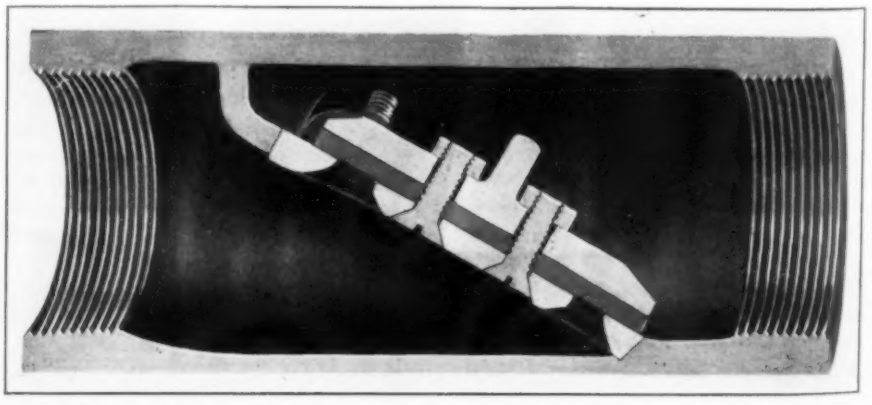


FIG. 2—SECTIONAL VIEW OF ONE OF THE ASSEMBLED VALVES

How and Why in Brass Founding

By Charles Vickers

Dirt and Color Harmful in Brass Castings

We have trouble making clean yellow brass castings. We send two samples; one showing the defects we complain of and the other made outside our foundry, having a color we desire to imitate. In our castings we add a small amount of aluminum to the metal to keep down the fumes while pouring. Can you tell us the cause of the dirt and bad color in our castings? Also how to get the color of the smaller casting?

Much of the dirt and shrinkage of the larger casting is due to the aluminum addition to the metal. However, outside of this it appears from tests we have made that the alloy is made largely from scrap and that it contains numerour impurities one of which is nickel, which when added to a leaded, aluminized yellow brass helps in the production of dirt and especially the small, irregularly-shaped, dark-colored pits.

The color shown by the small casting cannot be obtained if aluminum is added to the alloy and it will be necessary to put up with the smoke from the yellow brass when pouring. It also will be necessary to place the runners in the cope, the gates into the castings in the drag as much as possible, and to pour the metal strongly, filling up the pouring sprue and keeping it filled until the mold is filled, otherwise the castings will be *smoky* and no good. Do not use scrap, especially miscellaneous scrap. A good yellow brass ingot of approximately 68 per cent copper; 30 per cent zinc, and 2 per cent lead can be bought from any reputable manufacturer mentioned in the advertising columns of THE FOUNDRY. This will be found more economical than buying scrap metal, then doping it with aluminum. Home scrap, of course has to be utilized, but the composition of such material is known and it is thus easy to use. New metals also can be used and the formula given will give good results. Making of good, yellow brass castings is quite a trick, but it can be learned with a little perseverance.

Recommends Having Metal Analyzed

We have been making an alloy we call spike metal which contains 59.50 per cent copper; 39.50 per cent zinc, and 1 per cent aluminum. We have had good success with this metal, but the last lot we made was brittle. We send a sample for your inspection and hope you can tell us what is the matter with it. We believe the metal was poured too hot, or was heated too long before pouring. The mixture was made up of the same scrap metal we have used before.

The cause of the brittle condition is not pouring too hot, or getting too hot in the furnace, but because the copper content is too low. While the same scrap metals have been used as before, there has been some little slip somewhere, resulting either in increased aluminum or increased zinc, or both. It is impossible to tell by looking at the fracture whether it is the zinc or the aluminum that is too high, and this point can be determined only by a chemical analysis. We suggest that one be made by a competent chemist, that the results may be placed on file for future reference. Although 1 per cent of aluminum is high for a 60-40 brass, it ought to carry this and not become embrittled. If the copper can be brought up to 60 per cent full, and the aluminum is reduced to 0.50 per cent the result will be an improvement.

Nonshrinkable Alloy

We desire to obtain a formula for a nonshrinkable metal, or a metal as near nonshrinkable as possible for the purpose of casting match plates from working patterns, and of course the less shrinkage there is the better the match plates will be.

The following alloy is as near as it is possible to get to a nonshrinkable alloy in a commercial sense. The formula follows:

PATTERN ALLOY

	Per cent
Tin	50
Zinc	50

Melt the zinc first, add a piece of sheet aluminum 2 inches square as a flux. Do not allow the zinc to flare as this is unnecessary when a low melting metal like tin is to be alloyed therewith, although necessary when the alloying metal is copper. After the aluminum has dissolved, add the tin, stir the alloy, scatter a little sal ammoniac on the surface and pour.

This alloy shrinks only slightly and the rapping of the patterns will take care of that. A fine grade of molding sand should be used to make the molds, so that little finishing is required.

Aluminum Colors Copper

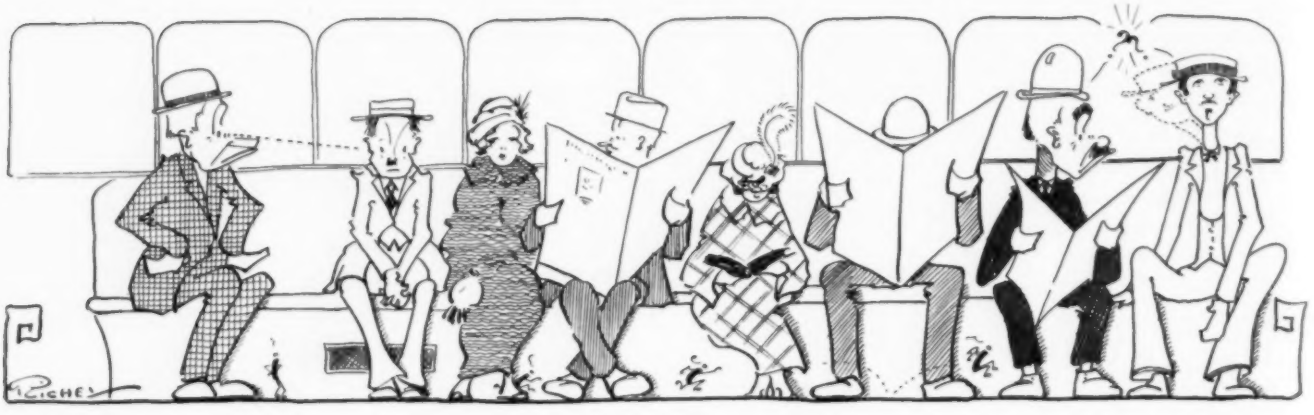
We are sending a sample of a broken casting for you to inspect the fracture and tell us, if possible what causes the red discoloration in the middle of the fracture. The mixture consists of 87½ per cent copper; 9 per cent tin, and 1½ per cent lead. The metal was not overheated, was well stirred after a small piece of phosphor copper was added. We think that some aluminum has got into the melt as this metal is very bad when it gets into a leaded bronze. We shall be glad of your opinion.

As the bushings has been turned up we are not positive about the absence of aluminum, but judging from the normal fracture we consider no aluminum present. Had there been any it would show on the skin of the casting as a shiny, fishy color. The discoloration in the fracture is known as copper spots, and it is a common annoyance to brass founders especially those who make car journal bearings, for while it does not harm a bearing, there is a superstition that it does. The ideal bronze bearing is one that is porous, the holes being fine, because such a bronze becomes saturated with oil and can never run dry. These discolored spots, are different from the remainder of the fracture because a portion of the alloy is missing from that place. This portion of the alloy is the part that is still fluid after the mass of crystals has formed. These crystals contain more copper, and are sometimes reddish in color, sometimes yellowish in color depending upon the amount of zinc present. The part that is absent is the eutectic which is dark, some say blue in color, and when it is normally present with the other crystals the fracture is inclined to be grayish in color.

Sometimes this eutectic will drain away from between the hot newly formed crystals, that is when the casting is not properly fed against the shrinkage; but in such a case as this bushing, we incline to the belief the eutectic was *blown* away from this part, and it looks, judging by the fracture, that it was blown away by gases from the core. They could not get away through the thickness of the core into the vent rapidly enough so they penetrated the metal taking the place of the eutectic. Have the core thoroughly vented at its middle, and swell out the main vent at this point. Also, vent the mold at the middle of the bushing, and scoop away the sand on the cope top and pour as hot as possible.

Bill Saves Time in Molding a Coke Pan

BY PAT DWYER



SEVERAL years ago when picture cards and so called comic post cards were considered more or less of a novelty, I received one from a friend bearing a legend to the effect that life is just one darn thing after another. In the original text the word darn was spelled in a slightly different manner, but in compliance with the views of the universal and well known national board of censors I am submiting an expurgated version. However, spelling or no spelling the fact remains that the statement contains the germ of truth and the author might have gone one step further and claimed that the things that follow one another are all pretty much alike.

For several years I have grabbed a morning paper on my way to the car that takes me down to the scene of my daily toil. As a result of long and diligent practice I can read all that part of the paper in which I am interested in just exactly the time the car consumes in making the run to my jumping off place. Without once raising my eyes or paying any attention to the mysterious announcements of the conductor, I know instinctively that by the time I have finished a certain column it is time for me to start fighting my way toward the exit. The morning paper is as essentially a part of the daily routine as the morning shave or the morning breakfast. On the few occasions when no paper was available I have experienced a distinct sense of loss all day.

This past summer I was out of town for a month and during that time I never saw my favorite sheet and was somewhat surprised to find that after the first day or two I did not miss it. I directed Bill's attention to the subject the other night and asked him how he accounted for a phenomenon of that character. He said that it simply confirmed him in an opinion he had held for some time that I did most of my sleeping by day and did not know it. However, by way of consolation he assured me that I was not alone.

"When you consider the aversion of the average man to changes and innovations" said Bill "the only wonder to me is that he has progressed so far. For example, consider the progress made in the past 100 years in the ancient and honorable art of casting metals. Taking it as a whole, the industry has made wonderful strides. The production of several classes of castings has been developed to a high degree of perfection. Information never was disseminated more freely than in recent years and yet you can go into many foundries and see methods and rigging in vogue that were employed in the days of our grandfathers. I have no desire to cast aspersions on the old time foundrymen. With the limited facilities at their disposal many of them turned out exceeding creditable work; but times and conditions have changed and methods that were satisfactory enough at one time are about as appropriate now as an ox drawn vehicle would be in a line of 10-ton motor trucks. The singular and peculiar manner in which foundrymen cling to established precedent in some instances is illustrated in the method practised in molding a certain casting for several years in a foundry where at one time I worked.

"The casting was a rectangular pan 6 x 4 feet, 1 foot deep, with a uniform metal thickness of 1 inch, designed for drying coke breeze. The pan was mounted on suitable brick supports over a firing chamber and after the coke was dried it was shoveled into 50-pound paper bags which then were taken into the open hearth department of a steel plant. When a heat of steel below the required carbon content was tapped, a sufficient number of these coke filled bags were tossed into the ladle while the stream was running from the furnace to raise the carbon content to the requisite point.

"So far as the service of the pan was concerned, a rough and ready casting would have been satisfactory. It was used continuously and in a comparatively short time, owing to the action of the fire under the bottom, it warped out of shape and cracked and then was consigned to the scrap pile. Castings do not last long in the slam bang life of a steel mill operated at high speed 24 hours a day 7 days a week.

"In this connection it is interesting to note the different view points held by men from opposite ends of the same plant. The open-hearth superintendent bewails the manner in which constant casting replacement increases his operating costs, while the foundry superintendent views his fat order sheet with quiet complacency and reflects on how nicely those things help to increase his tonnage record.

"This is one of the features of steel mill management at which I never have ceased to marvel. Instead of adopting a system whereby a foundry superintendent is paid a bonus for producing castings that will keep replacement expenses down, his efficiency almost invariably is based on the monthly tonnage produced. It is not unusual to find that he is paid a bonus for all tonnage turned out over a given quota. In a commercial foundry I am willing to admit,

the system has a certain degree of merit, but I must confess that its logic is wholly lost upon me when applied to a foundry operated as part of the repair department of an iron and steel plant.

"However, this merely is a digression and has no particular bearing on the subject in hand. Before resuming the thread of our narrative, as the old time story tellers were wont to remark every now and again, it is interesting to point out that when a method finally was adopted for making the pan at approximately 75 per cent reduction in cost no official recognition was accorded the foundryman nor was he decorated either with an iron cross or a distinguished service order ribbon. In fact I am inclined to the opinion that the management considered him more or less criminally negligent in not having adopted the method in the first place.

"In the orginal method, a full pattern was supplied designed to be molded bottom side down in the floor, with the body of sand forming the interior of the mold supported on a grating suspended from an iron cope. The methods of course is perfectly legitimate and is practiced extensively where circumstances warrant making a casting of this character in that manner.

"A hole approximately 1 foot larger than the pattern on all four sides and about 2 feet deep was dug in the floor and a coke bed was spread all over the bottom in the usual manner. Two short pieces of 6-inch pipe were set upright in diagonally opposite corners to conduct the steam and gas generated during the pouring process, away from under the bottom of the casting. Two straightedges were blocked up level and parallel on top of the coke bed to form a bed upon which to set the pattern and incidentally to form the bottom face of the mold. The straightedges extended approximately all the way across the excavation and were located about 7 feet apart to provide a generous margin of flat surface beyond the bottom face of the pattern on all four sides. The top edge of the straightedges was adjusted in line 1 foot below the floor level and as a result the upper edge of the pan pattern came flush with the foundry floor.

"Heap sand was shoveled into the hole and tramped down approximately level and about 1 inch below the upper line of the straightedges. A thickness of facing sand then was spread over the surface and also tramped down, after which an area corresponding roughly to the shape of the pattern was vented down to the cinder bed. A long straightedge was employed to scrape away the superfluous sand and the resulting flat, level bed was *felt* all over by hand and any minor depressions filled with facing sand. The entire surface was slicked lightly with the trowel and then the pattern was lowered into place and adjusted centrally in relation to the four sides of the excavation.

"Two draw gates 4 x ¼ inch were placed at one end of the pattern in such a manner that the stream of iron would be directed in a straight line between the vertical walls of the assembled mold on both sides. Vertical runners 2 inches square in cross section and 1 foot long were set at the outer ends of the horizontal draw gates and held in place with a shovel full of facing sand. The sand was peen rammed all around the lower edge of the pattern to insure a firm connection with the vertical wall and thus prevent the metal from straining along this line when the mold was filled with iron. Facing sand was banked about half way up on the outside wall of the pattern the space between the pattern and the sides of the excavation were filled to the same height with black sand which then was rammed firmly. A row of rods each about 12 inches long and spaced 4 or 5 inches apart was laid on top of the sand to reinforce the wall and prevent it from caving in under the weight of the cope when the mold finally was assembled. A second course of sand rammed and rodded in a similar manner brought the sand to the top of the pattern where it was scraped off flush and level and slicked for a distance of about a foot beyond the pattern on all four sides to form a parting and a seat for the flat iron cope. An iron plate was hammered down into the sand at each of the four corners to provide additional support for the cope.

"Four short pieces of *soldiers* about 1 inch thick were spaced on the inside surface of the pattern about 12 inches from each corner to prevent the grating from touching the pattern and after a thickness of facing sand had been sifted over the surface, an iron grating, sometimes referred to as a *crab* or an *arbor*, was lowered into place. The face of the mold was gaggered through the openings in the grating and a light course of heap sand was hand rammed flush with the upper face of the grating. Two bricks, one flat and one on end were erected on the grating close to each of the lifting staples and an additional pair erected on the center of the grating to serve as studs in resisting

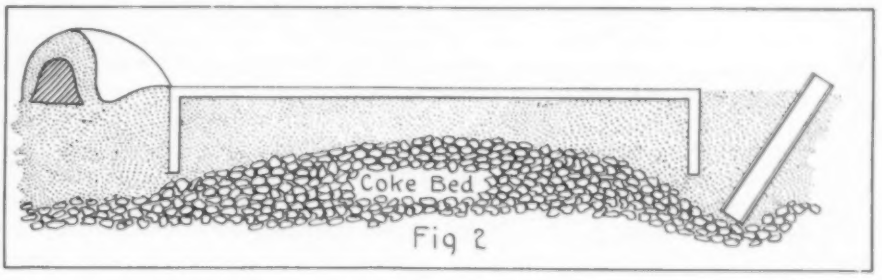


FIG. 2—IN THE SECOND METHOD ADOPTED AN OPEN FRAME PATTERN SERVED TO MAKE AN OPEN SAND MOLD THAT WAS POURED FROM A BASIN DIRECTLY OVER ONE END

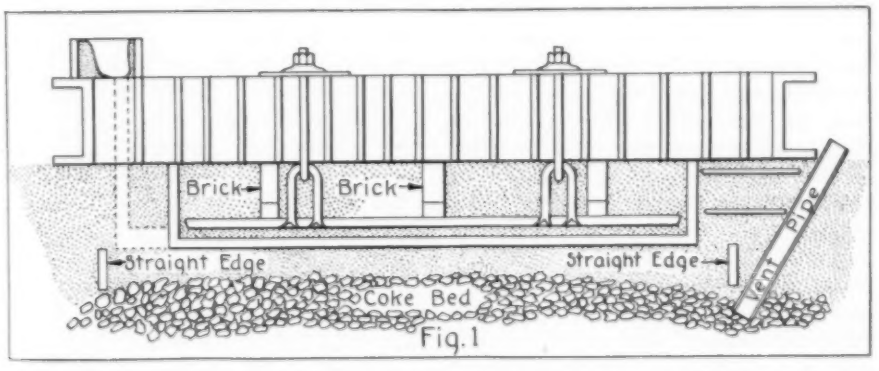


FIG. 1—LONGITUDINAL SECTION OF COMPLETED MOLD AS IT WAS MADE IN THE FIRST INSTANCE—NOTE THE EXTENT OF RIGGING AND EQUIPMENT REQUIRED

the upward pressure of the iron while the mold was filling. The inside walls of the pattern were covered with facing sand, after which heap sand was shoveled in and rammed flush with the upper edge of the pattern.

"Parting sand was sprinkled over the slicked surface outside the pattern and then the iron cope was lowered into place and adjusted in such a manner that an opening between two chuck bars came over each of the lifting loops in the grating. Two gate sticks were set in the vicinity of the runners already in the sand and then the cope was gaggered and rammed full of sand with the exception of the four openings above the lifting hooks and the brick pier standing on the center of the grating. A piece of steel plate long enough to engage two adjacent bars was wedged down firmly on each brick, after which a hook bolt was attached to each loop and screwed up tight through suitable plates and washers resting on top of the flask bars. The cope was vented, staked at the four corners, lifted off and set up on high stands where it was finished and blacked. The copes on the first few molds were skin dried, but this refinement was omitted subsequently.

"After the bottom part of the mold was finished, the cope was replaced and then an interesting argument arose over the weight required to hold it down. The man who made the job held to the opinion that since the casting itself weighed less than a ton, the cope and contents weighed about 3 tons, therefore two long weights of about 2 tons each would be sufficient. The gaffer, as I learned afterward, was not familiar with the method of figuring problems of this character, but he was a man with long, practical experience and was familiar with the tremendous pressure exerted by a high pouring head on a flat surface. Furthermore, he was a firm believer in the old adage that it is better to be sure than sorry and he ordered the man to place weights aggregating 15 tons on the cope. Just to show you how dumb some people can be in carrying out orders, the molder placed the weights directly on the cope and, of course, caved in the sides of the mold. On the following mold the same weights were employed, but the ends were supported on blocks placed on the floor about 2 feet away from the sides of the flask and wedges were driven between the bottoms of the weights and the upper flange of the cope.

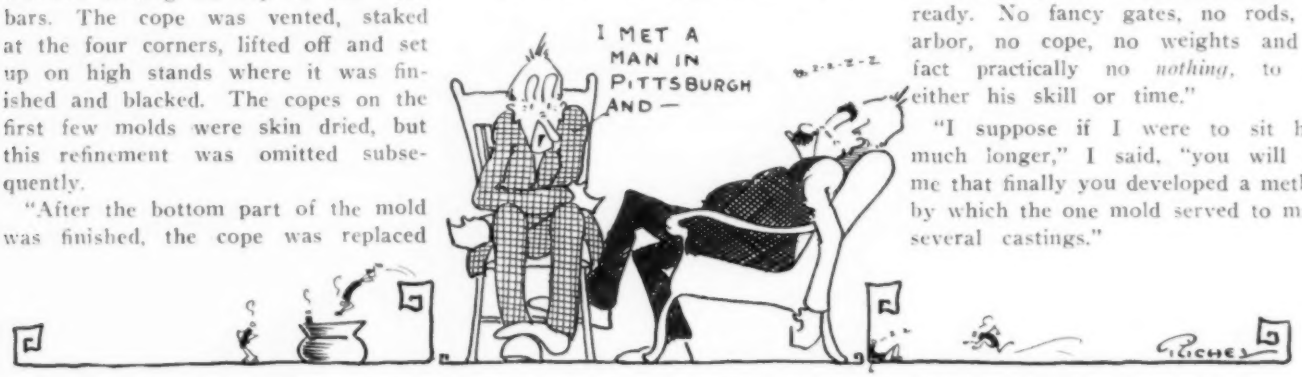
Holds Mistaken Views

"I was only an humble toiler in the vineyard in those days and, therefore, did not feel like offering an opinion, but had I been consulted I could have told them that they both were wrong. The first man based his opinion on the weight of the casting, a factor which has no bearing whatever on the pressure exerted. The second man relied on rule of thumb and experience and as a result tied up several weights that were needed on other jobs and wasted the time of the craneman in shifting them twice and this at a time when the craneman was as busy as a one-armed paper hanger afflicted with the itch.

"The rule for finding the weight required to hold down a cope is so simple that I cannot understand why many foundrymen remain in ignorance of it all their lives. It is only necessary to figure the area exposed to the iron, multiply this by the height of the pouring head, multiply the result by 0.26 if the calculation has been in inches and the answer will be the weight required in pounds. Divide the result by 2 if the calculation has been in feet and the result will be in thousands of pounds. Dividing by 2 will give a weight a little in excess of that required because it is based on the supposition that a cubic foot of iron weighs 500 pounds, whereas in reality it only weighs 450 pounds, but the result will be near enough for all practical purposes. In fact the extra weight may be regarded as the usual factor of safety. In the present example, the area exposed to the lifting pressure of the iron is 6 x 4 feet. This, multiplied by the height of the pouring head 2 feet, gives us the formula 6 x 4 x 2=48. Multiplying 48 by 450, (the weight of a cubic foot of iron) will indicate that 21,600 pounds is the weight required. However, 48 divided by 2 will give 24,000 and that is near enough for a foundryman.

"Castings were made in the manner outlined for several years and then some person suggested that a satisfactory casting could be produced upside down in an open sand mold. A new pattern was provided consisting simply of a rectangular frame without any bottom. The molding problem was so simplified that an apprentice made a casting in half a day which formerly occupied the time of a first-class molder two days. After the coke bed was placed, the boy leveled his pattern on four bricks, one under each corner, rammed the sand on the inside and outside simultaneously, vented the inside, scraped away a thickness of sand to form the bottom of the pan, made up his runner, drew the pattern and the mold was ready. No fancy gates, no rods, no arbor, no cope, no weights and in fact practically no *nothing*, to tax either his skill or time."

"I suppose if I were to sit here much longer," I said, "you will tell me that finally you developed a method by which the one mold served to make several castings."



IT DOES NOT FOLLOW THAT ALL STORIES ABOUT PITTSBURGH NECESSARILY ARE TINGED WITH A TRACE OF SMOKE

"No," said Bill. "I did not. I won't deny that I turned the problem over in my mind many times, but I never hit on a solution that promised a reduction in the cost of producing the casting. In common with many foundrymen, the permanent mold bee has buzzed around in my bonnet to a considerable extent, but outside of a few simple shapes I never succeeded in producing castings by that method. A few months ago I met a man in Pittsburgh who claimed to have done some advanced work along that line. He showed me several iron and steel castings which had been poured in metal molds."

"Never mind the man from Pittsburgh," I said. "If you start talking about permanent molds, heaven only knows when you will stop and I have heard enough for one night. The only permanent object I am interested in at the present moment is a more or less permanent bed where I can get a few permanent hours' rest."

Outline Steel Casting Trend

Green Sand Molds, Rammed Hard, Becoming More Widely Used—Rigid and Accurately Machined Flasks and Equipment Aid—Field Pointed Out for Making Castings in Dry Sand Cores

BY EDGAR A. CUSTER

WHEN one compares the rise of the art of making steel castings with the ancient and honorable art and mystery of grey-iron founding, it will be found that the history is in many respects a duplicate of the progress of what we now call steel as compared with wrought iron. The infant steel passed through all the ills incident to babyhood; he had his colics and fevers and tried to run before he walked. In the period of adolescence his feet and hands were far too large for the spindling body but he grew. Wealth began to notice the big awkward boy and poured out its substance that the way of realization might be made smooth; the brains and brawn of the world ministered to his insatiable appetite and when manhood came he was the giant of giants, the king of kings. His rule was absolute; all industries bowed to his will and fed on his largess. The staid old world acquired a new period, the Age of Steel.

Meanwhile that old gentleman, older than Methuselah and all his ilk combined, Mr. G. I. Founder, ambled quietly along. His place in the sun seemed secure, his was an art which had been acquired by centuries of experience, an art built around well guarded secrets, something which never could be displaced or overshadowed. He watched with some amusement the sporadic efforts of the embryonic steel founders and then suddenly woke up—the infant was keeping step with him, an infant no longer but a virile man who bid fair to push him far to the rear. The old gentleman was a philosopher of the modern school and instead of fighting a proven rival, opened wide his arms and made him an associate. More than that, he changed his ideas and gathered his clans that they might meet with the newcomer and exchange knowledge and ideas. The policy of isolation and secrecy was abandoned; he realized that young steel casting had come to stay and that brains and research must be the keynote of his own future.

Stronger Sand Required

When the modern steel casting was first attempted, it quickly was found that the sand and materials used in gray-iron foundries would not make suitable work. Stronger sands had to be found and developed, the best binders investigated and the proper pouring heat determined. The almost universal scheme of drying the mold was thought a *sine qua non*. Some few founders attracted by the idea of cheapening the molding cost, tried molding in green sand but with indifferent success. The traditions of gray-iron founding seemed to have a dampening effect on the steel casting industry. When the molds were rammed as in gray iron, any attempt at casting in green sand was a failure. So it was small wonder that it was considered an axiom that the molds must be well vented, porous and absolutely dry if a good casting was to be made. In the late eighties an Ohio foundry had a vision and cast some locomotive main driving rods and about ten years later, an Eastern concern made a desperate attempt at casting locomotive frames in green sand. They were trying to run before they could walk.

The advent of the jarring machine and its use in steel foundries opened the way toward making a success of casting steel in green sand. Where and when the first successful practice was established is a moot question but the weight of the evidence is that it originated in the Middle West. At least green sand molding is gradually moving east, Pittsburgh and Buffalo seem to mark the eastern frontier. Of course almost every steel foundry makes a few castings in green sand but they are simple in design and light of weight. West of Pittsburgh there are foundries where fully 80 per cent of their output is made in green sand and they are laying plans and making researches into methods and equipment whereby this percentage may be increased.

Is has been generally considered that locomotive castings must be made in dry sand, but today there are foundries which produce work in green sand that passes the most exacting railroad specifications. Driving boxes, crossties, back and front cylinder heads, valve yokes, footplates and even that bane of the steel founder's existence, the celebrated steam valve stand, come through with flying colors. The fact that the casting is heavy and complicated has no terrors for the green sand molder. Today his eyes are fixed on driving wheel centers, tomorrow he may turn to locomotive frames.

Sand Rammed Hard

As has been said, the jarring machine opened the way for successful green sand molding, although the air rammer can and does play a prominent part in some phases. After the proper sand and binder are determined, the underlying principle of green sand work is to ram the molds hard and butt off the flask. As a corollary they either are poured with horn gates or from side gates at the bottom. Giving each mold at least 100 blows or more marks the first step. Where there are bars or gaggers more blows are given; 130 to 150 is a common practice. When the molds come from the machine they are so hard that one can make no impression with the fingers and in fifteen minutes they dry out so that the thumb nail can make no impression. Indeed they are fully as hard if not harder than the dry sand mold. There are no vent wires used and in many cases gaggers are dispensed with. To the gray-iron molder this apparently excessive ramming would seem rank heresy, but the

Expert Gives Freely

THE present status of practice in the steel foundries in the United States is reviewed in the accompanying article by a foundryman known throughout the industry for his development work on permanent molds and as a widely experienced consulting foundry engineer. Such a study as Mr. Custer has made with the assistance of the progressive steel foundries which welcomed him freely to their shops is of the utmost value to the industry. Growth is possible only as the knowledge acquired by those leading in the progress of the casting art give freely of their experiences. One of the outstanding features noted by Mr. Custer is the hard ramming of green sand molds. This evidently requires a coarser grade of sand than is common as ordinary steel sand gives difficulty when rammed hard.

molten steel lays up to the mold and the casting comes out without a sign of scabbing. Moreover, the sand peels readily and there is rarely any sign of fusing. No coating or wash is applied to the mold, and there is no skin drying.

When good, stout flasks with machined joints are used fins are entirely eliminated. Cleaning then becomes a matter of rapping off the loose sand and removing the gates and heads. What this means to the steel founder, using the dry sand molding exclusively, may be best appreciated when it is considered that the cost of cleaning castings in such a shop ranges from 40 to 60 per cent of the total labor charge. Chipping statistics from three foundries are cited in the accompanying table to show the effect green sand molding has upon this part of the work. All three of the foundries have a high reputation in the trade and are working on virtually the same class of work. Two of the foundries have 80 per cent of their production on green sand and the remainder is dry sand. The third plant is exclusively dry sand.

Green Sand Castings Require Fewer Chippers

Foundry	Tons per month: Green	Dry	Total	Chippers employed	Tons chipped per month per man
1	1,760	440	2,200	75	29
2	1,480	420	1,900	66	29
3	....	2,400	2,400	137	17.5

Flask Equipment Diversified

The flask equipment of the three foundries is highly diversified. One plant has a large part of its equipment made up of rugged flasks and plates accurately machined, the rest of it consists of homemade built-up flasks and cast-steel ones not machined. The second plant has in the main wooden flasks for the smaller work and unmachined cast ones for the rest. The third plant, working on dry sand, employs cast-steel flasks, some machined and others rough. All three plants are substituting heavy machined flasks for the old style. Notwithstanding the wide difference in flask equipment, all three plants are turning out a high-class product. They are unanimous in declaring their preference for the heavy machined flasks not only for their ultimate economy but also, and perhaps their principal reason, because it is much easier to break a green man into the work. So that it would seem that the quality of the castings rests mainly with the green sand method. Where machined equipment is used the production per man per day rises far beyond that which is attained when rough or wooden flasks are used, and there are less defects.

All foundries use a high-grade silica sand but the character varies. One foundry uses a rather coarse silica sand in its green sand work and the other uses a medium grade. Both follow practically the same procedure in preparing the sand for molding. In Foundry No. 1 a facing is prepared as follows:

Four wheelbarrows of washed green sand.

Four wheelbarrows of dried green sand.

Two shovels of compound.

One bucket of molasses water, 1 to 25.

One gallon crude oil.

This is ground in a mill and the pattern is coated with about ½ inch of facing where finish is required.

The flask is then filled with a backing made up as follows:

Two wheelbarrows of green sand.

Six wheelbarrows of burnt sand.

Two shovels of compound.

One bucket of molasses water.

One gallon of crude oil.

Ground and mixed as was the facing.

Foundry No. 2 uses and treats the facing and backing sand about the same as No. 1 but uses ground fireclay instead of the compound. So here we have two foundries, one using coarse silica sand and commercial compounds and the other using a finer sand and fireclay and both are turning out high-grade castings, easy to clean, practically free from fins, and smooth of surface.

Pour With Horn Gates

The one thing in common to both foundries is that they ram the molds exceedingly hard and pour either with horn gates or from the bottom with side gates. This would seem to be the secret of successful green sand molding. Working from this basis, one can easily imagine what the future has for steel castings. It is not hard to visualize a foundry where the ovens are used only to bake cores; where the molds are ready to pour within fifteen minutes of ramming and where, perhaps, the use of small open-hearths or electric furnaces make continuous pouring a regular part of the day's work.

The general trend of all green and dry sand foundries is toward equipping the plant with heavy flasks and jolting plates accurately machined. The flanges are at least 1¼ inches thick and are reinforced to 2 inches where the pin holes are drilled. The reason for this extra thickness is that the holes retain their original size much longer than the thin flange. Some flasks have two or more extra holes in which key bolts and wedges are used in place of clamps. These holes are always drilled ¼ inch larger than the pin holes so that there can be no mistake when closing. All holes are accurately placed and drilled. As a general rule it is better to use hardened and ground steel flask pins. As the size of the flask goes up so also does the thickness of the flange and flask side. One foundry making locomotive frames uses a flask 36 feet long with flanges 3 inches thick. The flanges are strengthened with brackets at intervals, and lifting loops are cast solid in the cope and drag. The cope, drag and bottom plate have a total weight of 15 tons and are made of cast steel. In consequence of this a rammed mold can be carried to any part of the shop, rolled over and placed in position without the slightest sign of sagging. A baked mold never cracks or spawls in handling. An 84-inch diameter flask for wheel centers has flanges 2¼ inches thick, has a strengthening rib between the flanges, and has trunnions 3 inches in diameter at the hook groove. One foundry casts a grid on the top of the wheel flask cope and the bottom of the drag and dispenses with bottom boards for the drag and uses no gaggers in the cope. The bars of the grid are spaced about 8 inches and are 1 inch thick at the outer side tapering to ¼ inch at the inner. When the grids are cast on the flask care must be exercised to have the trunnions as near the center of gravity as possible, otherwise turning over becomes a hazardous job.

Require No Repairs

Flasks such as have been described keep their shape and accuracy of joints a long time. They require no repairs other than an occasional truing up where the joints have become nicked or scored by rough usage. It is true that the smaller flasks cannot be handled as easily as lighter steel or wooden flasks but as practically all the molds are handled by cranes, this cannot be a great objection. Aside from their economy, the flasks make for a greater production per man per day. When a roll-over, draw and jarring machine is used on green sand, there is practically no skilled work necessary. The average man can be taught quickly and in a few days is up to his maximum production.

It has been noted that green sand castings have a better surface and less defects. Where accurate equipment is used fins are not found on the castings. Where the proper sand mixture is used it is rare that any sand is fused to the casting. The work of the chippers is

reduced amazingly. One or two foundries cast a nick in the bottom of the risers and knock them off either with a weight swung from the crane or with a modification of the plugging gun. Twelve 10-inch heads are knocked off in four minutes and cold saws are eliminated.

Each foundry is working out its green sand problem in the way which will give the best result, taking into consideration the character of the castings, the local conditions, and the state of its finances. Where the main product is a number of specialties the problem is comparatively simple, but when the work is varied and ranges through the general jobbing trade, it is quite a complicated question and must be given deep study before any radical step is taken. It looks easy and simple to see a green sand foundry making up the floors much in the manner of a gray-iron plant and apparently on the verge of continuous pouring but it must be remembered that even though 80 per cent of the production is in green sand, the onward march was made only by much costly experimentation and many disheartening failures. These results so far are a high tribute to the persistence and sane research of the steel casting people. There are many difficulties to be overcome before these foundries are in a position where labor and material cost is reduced to the minimum and quality is raised to the maximum but they are on the road and the goal is not far ahead.

Present Difficulties

While the green sand foundrymen are moving forward, the dry sand people have not been idle. The present state of the art would seem to prohibit making a number of castings in green sand. Some castings such as locomotive frames, the framing for tenders, and truck frames cast in a single piece, present almost insuperable difficulties in green sand when the specifications call for well-nigh perfect castings, free from checks and welds, also, on account of their size and complicated section, such castings are cast in dry sand. The molds call either for immense ovens or a portable arrangement hich covers the mold and through which a current of hot air can be driven. Either way is costly in time and labor, is wasteful of fuel, and cuts down production. The modern steel foundryman producing such castings is turning to casting in molds made entirely from cores. Some firms have patented their particular process and product, but the field is wide and the methods and products are by no means completely covered.

The idea of casting in cores is attractive when the low cost, entire absence of flasks, and accuracy of product is considered. The cores can and are made with extreme accuracy and are dried with a minimum of oven capacity. There are no heavy flasks to lift and heat, no cracking or distortion when the cores are properly rodded or arbored. The cores are set up in permanent pits so arranged that they can be adjusted to the size of the complete nest of cores. The work of assembling is quickly and accurately performed and the work is open for inspection at all stages. Much secrecy is practiced in this method and the founders are disinclined to throw their foundries open to inspection. But in the main, the broad principle of casting in cores is wide open. Without entering into any discussion of this feature, it may be said that there are an infinite number of methods whereby the art can be practiced and a close examination of the existing patents will shed considerable light on the subject.

Alloys Pattern To Draw

One method consists of making a pattern which gives the general outline of the casting with such prints as will support the inner cores and will allow the pattern to draw. This is placed in a corebox and core sand is rammed or jarred around the pattern. The pattern is drawn and the box removed. The base core is then ready for dressing and drying. The inner cores are made on a machine plate which goes with the cores through the oven and later serves as a support on the bottom of the permanent pit. The plate is provided with suitable hangers or supports and in that manner the cores are carried without danger of cracking or straining. When the base core is placed in the pit, the inner cores are set. It should be said that the base core is always 1 or 2 inches less in overall size than the pit. After the inner cores are set, the space between the pit and the base core is rammed with heap sand, thus holding what might be termed the drag firmly in position. All four sides of the pit are of cast iron, the inner side machined. One side is movable and when the core is lowered into the pit, is is shoved tight against two of the sides. The third or movable side is then shoved against the core leaving but one side which requires filling with heap sand. The cope with risers and runners may be either a cover core or made in a flask in the usual way. Castings thus made have a minimum amount of fins, the amount depending on the accuracy with which the cores are made and the skill and care of the workmen.

With this process the production depends on the number and size of the pits. No flasks need to be moved around or stored. There is no hectic jolting or digging the sand from the flask or the casting from the sand. When the casting is ready for removal, a crane hooks onto the hangers, and casting and sand are lifted cleanly from the pit and sent to the cleaning room. There may be six or eight core ramming boxes but these with the bottom plates constitute the entire movable equipment.

Some deep thinkers and investigators are of the firm opinion that the trend of the steel casting industry is gradually but surely toward making the bulk of steel castings in green sand and the remainder in cores; that practically continuous molding and pouring will be the logical result of this trend, and that the day is not far distant when both of these propositions will be realized.

Book Review

Wood Pattern Making, by Herbert J. McCaslin, 296 pages, 5 x 7½; published by McGraw-Hill Book Co., Inc., New York and supplied by THE FOUNDRY, Cleveland, price $2.25.

This volume is a textbook for the student of pattern making. It treats of the selection of woods and tools and outlines the essentials of a patternmaker's education. The main divisions of the book are devoted to the subjects of bench and lathe work, and each is illustrated by numerous practical applications and models, which constitute a progressive series of problems and a fundamental course in pattern making leading to more advanced work. Because a knowledge of foundry practice is indispensable to a successful patternmaker, this factor which characterizes making patterns from other kinds of woodworking is stressed in each design.

The book's purpose is to follow the principles of molding and pattern construction which generally are conceded to constitute good practice when a limited number of castings is required and the castings are made as individual molds rather than to consider the construction of patterns adaptable to production methods. The author realizes his experience with molding machines that many of the designs or models illustrated could not be made in the same manner for quantity production.

For the use of apprentices in pattern shops or for general reference as well as in industrial training schools this text will be useful. The author is instructor in pattern making at the William L. Dickinson high school, Jersey City, N. J. His experience during the last twelve years enables him to feature the important details of pattern making and qualifies him to discuss the subject of foundry pattern construction.

Molding Machines, Both Power and Hand Operated, Were Shown in Extensive Variety

Foundrymen Meet in Hamburg

BY HUBERT HERMANNS
German Correspondent, THE FOUNDRY

SEVERAL features connected with practical foundry operation were discussed before the general session of the Verein Deutscher Giessereifachleute and the Verein Deutscher Eisengiessereien which was held at the same time and in connection with a foundry exhibition at Hamburg, Germany, Aug. 19 to Sept. 21. A new theory on the side-blown converter process was advanced by P. Laval. He stated that according to his experience and observation the secondary constituents of the iron bath in the converter are not burned through combining immediately with the oxygen of the air. Instead, the iron first is oxidized and forms ferrous oxide. The oxides of the iron are the oxygen carriers for the silicon and manganese and these are the elements that promote the process of combustion. This round about method explains to some extent why the converter process is so slow. He claimed that the time consumed in the process may be cut down by shutting off the blast before all the carbon has been burned out of the metal. However, he pointed out that only an operator of the greatest skill and experience is competent to determine the correct point at which the blast may be shut off.

Hubert Hermanns presented a new method for preparing heat balance sheets in connection with the converter process by which it is claimed the various actions and reactions of the elements clearly are indicated.

The Geologische Landesanstalt, National Geological institute, through Professor Behr presented a report on the work that has been carried out so far in locating deposits of molding sand in Germany. A map has been prepared on which the location of the deposits has been indicated together with the character of the sand and the class of work to which it is best adapted. Other items of information including the distance the sand has to be transported to the various centers and the approximate cost of transportation form additional features of the report.

German foundries recently have collaborated to the extent of having a motion picture film produced illustrating all the various processes incident to the production of gray iron castings. The film was designed primarily to serve in an educational capacity and aroused considerable interest when displayed for the first time at the convention. A second film also was shown illustrating the various steps pursued in the manufacture of bells.

Dr. Ing. Kuhnel delivered a lecture explaining the separation of the constituent elements in castings of various metals. As a result of his investigations he claimed that the phenomenon of the separation of the constituents by zones in both ferrous and nonferrous castings, follows a certain law and is caused by the separation of crystals. While the metal is passing from the liquid to the solid state every mixed crystal at first forms a skeleton crystal, surrounded by the still liquid mixture. Where a long time elapses between the beginning and end of solidification the fluid mixture will be forced to move and to separate into its constituents by zones.

Acting on instruction from the foundrymen's committee dealing with engineering phases of the industry, Professor Bauer has carried out experiments to determine the relationship existing between the contraction and shrinkage of cast iron in comparison with the weight of volume

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

SPECIFICATIONS FOR BRASS INGOT METAL

(*Continued from Data Sheet No.* 494)

(*b*) If the purchaser elects to have inspection made at the manufacturer's works, the inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of manufacturer's works which concern the manufacture of the material ordered. The manufacturer shall afford the inspector, free of cost, all reasonable facilities to satisfy him that the material is being furnished in accordance with these specifications. All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

9. If the test ingots selected to represent a lot fail to conform to the requirements specified in sections 3 and 4, all ingots in such lots will be rejected.

V. Claims

10. Claims, to be considered, shall be made in writing within 30 days of receipt of material at the purchaser's plant, and the results of the purchaser's test shall be given. The shipper shall, within one week of receipt of such claims, either agree to satisfy the claim or send a representative to the purchaser's plant to resample the shipment, as specified in section 5. Samples so taken shall be sealed and submitted to a mutually agreeable umpire, whose determination shall be final.

11. The expense of umpire analysis shall be paid by the loser or divided in proportion to the concession made in case of a compromise. In case of rejection being established, the damages shall be limited to the payment of freight both ways by the manufacturer for the substitution of an equivalent weight of ingot metal meeting these specifications.

Appendix

The data in the following table do not constitute a part of these specifications. They are given merely to indicate to the purchaser the physical properties of the

(*Concluded on Data Sheet No.* 496)

SPECIFICATIONS FOR BRASS INGOT METAL

(*Concluded from Data Sheet No.* 495)

various alloys specified which can be expected of carefully manufactured alloys of the formulas indicated, and to constitute a guide to the purchaser in selecting the grade best suited for meeting the service condition for which the ingot metal is to be used.

PHYSICAL PROPERTIES OF BRASS INGOT METAL ALLOYS

Alloy, grade No.	—Desired composition— Copper, per cent	Tin, per cent	Lead, per cent	Zinc, per cent	Tensile strength, lb. per sq. in.*	Elongation in 2 in., per cent*	Reduction of area, per cent*	Brinell hardness (500 kg. for 30 sec.)	Shrinkage, in. per ft.	Weight, lb. per cu. in.
1	87	8	2	3	30-36 000	25-30	25-30	....	0.125	0.31
2	85	5	5	5	27-33 000	16-20	15-20	50-60	0.14	0.31
3	83	4	6	7	28-33 000	15-20	20-26	55-60	0.125	0.31
4	77	3	10	10	23-28 000	10-15	10-15	50-55	0.125	0.32
5	76	2	6	16	25-30 000	20-30	20-30	43-48	0.18	0.31
6	65	..	2	33	25-30 000	20-30	25-35	37-42	0.18	0.30
7	60	..	3	37	30-45 000	15-25	20-30	43-48	0.20	0.29

*The tension tests were made on "sand cast-to-size" test specimens.

Grade No.	Example of Uses	Foundry Manipulation	Characteristics
1	High grade steam metal	Easily handled	Machines well
2	Medium grade red brass for general service	Easily handled	Machines more readily than No. 1.
3	Medium grade red brass for general service	Easily handled	Machines more readily than No. 1.
4	Valves and fittings for low pressure	Not difficult	Machines very easily.
5	Reddish yellow alloy, for air, gas and water fittings	Not difficult	Machines very easily.
6	Yellow brass for general service	Difficult. Aluminum up to 0.3 per cent improves casting properties, but increases shrinkage.	Machines poorly. Not suitable for bearings or water pressure fittings.
7	Plumbers' flanges, scupper pipes, etc.	Very difficult. Aluminum up to 0.3 per cent improves casting properties, but increases shrinkage.	Hard to machine. Not suitable for bearings or water pressure fittings.

MALLEABLE IRON
PIPE FITTINGS
FOR GAS STEAM AND WATER
STEEL FITTINGS
FOR HIGH PRESSURE SERVICE
GALVANIZING, TINNING
JAPANNING

AIR FURNACE REFINED
MALLEABLE IRON AND
SEMI-STEEL CASTINGS
CARBON AND ALLOY
STEEL CASTINGS
CONTRACT MACHINING

INCORPORATED 1864

Malleable Iron Fittings Company

ADDRESS ALL COMMUNICATIONS TO THE COMPANY
IN REPLY TO THIS LETTER PLEASE REFER TO THE ATTENTION OF GBP/N

Branford, Conn. May 25, 1923

The Penton Publishing Co.
Cleveland, Ohio.

Attention - J. D. Pease - Director Advertising Sales

Gentlemen:

It is certainly a great pleasure to us to comply with your request in your letter of May 23rd. The function of THE FOUNDRY in connection with our sales was really to put the Branford vibrator and Branford vibrator accessories on the map. We started out with nothing but a manufacturing space in our plant and the only sales force we had was THE FOUNDRY. This little business started in 1915 and has grown to such an extent that our sales are now ten times greater per month than the best month in 1915. We attribute this solely to the salesmanship of THE FOUNDRY.

In the past few years of course our jobbers and distributors have added greatly in the sales but their sales effort is backed up to a great extent by THE FOUNDRY.

As one of your old subscribers, we are consequently glad of this opportunity to say a good word for THE FOUNDRY.

With kindest personal regards, we beg to remain

Yours very truly,
MALLEABLE IRON FITTINGS COMPANY

G. B. Pickop

G. B. Pickop 2
Assistant Superintendent

of the casting. As a result of his investigations he presented conclusions tending to show how these undesirable features may be reduced or eliminated by the manner in which the pattern is placed in the mold, by the use of suitable feeders, either open or closed, by the use of a suitable iron mixture which will delay the graphite deposit and by pouring the iron at a moderate pouring temperature. In conclusion he stated that iron with a high sulphur content should not be used since it has a tendency to promote shrinkage and contraction in iron.

Novel German Devices Exhibited

HOUSED adequately in the exhibition sheds of the zoological gardens the exhibition and convention held in Hamburg under the auspices of the German Foundrymen's association demonstrated the application of science to the art of founding in metals. The exhibition was made up of two sections, scientific and practical, arranged in different parts of the building. Drawings, patterns, photographs and diagrams in the scientific section indicated the improvements that may be effected by using measuring appliances for temperatures and gases, by the use of suitable fuel and furnaces and by the employment of welding outfits, welding machinery and welding processes. This section was designed primarily for the benefit of foundry apprentices, but it was equally valuable in showing the practical foundryman how to avoid many of the mistakes common in operation. The scientific section was designed to convey an instructive idea of all phases of the foundry business.

General foundry equipment partly shown in operation was exhibited in the part of the building devoted to the practical section, and included: melting appliances for iron and other metals, drying stoves and furnaces, sand mixing equipment, molding machines, electric welding appliances, laboratory equipment, plants for recovering foundry waste, raw materials and tools for foundries.

An interesting model of a cupola furnace by Bestenhostel, with inclined shaft is shown in Fig. 1. In charging the usual vertical cupola from one side, especially in cases where an inclined elevator is employed, the material accumulates on the side opposite the charging door so that the layers of iron and coke are not distributed horizontally and uniformly one above the other. The result is that the melting process is affected detrimentally, the coke consumption is increased, the molten iron has not the same temperature throughout and the lining of the stack will be damaged. The inclined stack is designed to eliminate these disadvantages. The suggestion, so far, has not been tried out in actual practice.

Under present economic conditions in Germany, electric melting furnaces either for ferrous or nonferrous metals, do not play the important role they do in the United States. The price of electric current in Germany is too high in comparison with the price of other fuel and for that reason more than any other the electric melting

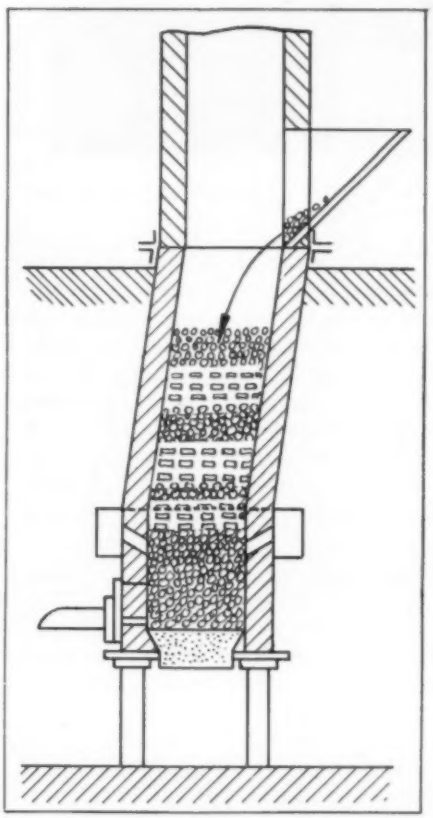


FIG. 1—A CUPOLA IS PROPOSED WITH AN INCLINED STACK TO FACILITATE MECHANICAL CHARGING

furnace has not been adopted to any extent. This condition probably will obtain for a considerable time and certainly will obtain in the immediate future, and this explains why illustrations alone of electric furnaces were shown at the exhibition. No improvements worthy of comment were noted.

Oil-Fired Furnaces

The oil-fired crucible furnace shown in Fig. 2 attracted considerable attention. Instead of the usual solid sheet this furnace is enclosed in a perforated metal shell which it is claimed has increased the radiating area at least 100 per cent and thus has a tendency to keep the air cool in the immediate vicinity of the furnace. This melting device is mounted partly in a pit for the convenience of the operator in charging and tapping the metal and also in watching it during the melting process. The furnace is tilted by a hand wheel operating a worm and worm gear through a pair of miter pinions mounted in a suitable housing.

Oil and air for combustion enter the body of the furnace through the hollow trunnions on either side and are conducted through suitable piping to the burner shown at the back of the furnace in Fig. 2. The compressed air is passed through an air chamber immediately below the melting chamber and in that manner the outer wall of the melting chamber is cooled while the air is heated to a certain extent before it enters the burner nozzle. The burner is detachable and is not subjected to the reflected heat. It is made up of three nested nozzles and is arranged in such a manner that the inner section may be adjusted at any desired angle at the time the connection is made with the outer nozzle by way of a flexible tube. The oil stream is thrown against a strainer and atomized in front of the burner and the inner nozzle deflects it to the most advantageous angle.

The burner and nozzle are located exactly opposite to the two openings, one designed for pouring the metal from the crucible and the other provided to facilitate the removal of any metal that may spill in the chamber in the event of a crucible breaking. The furnace tips forward and, therefore, since the burner is placed at the back and travels with the furnace, it always will be on the high side while the molten scrap metal is collecting in the pan and draining through the clean-out hole.

The flame from the burner enters the melting chamber around the plate supporting the crucible and rises around the crucible itself. Hence metal in the bottom of the crucible melts first and gradually moves upward until the entire charge is melted. The furnace is provided with a pair of arms which hold the ladle automatically suspended under the spout in a vertical position while the furnace is rolling down and emptying its con-

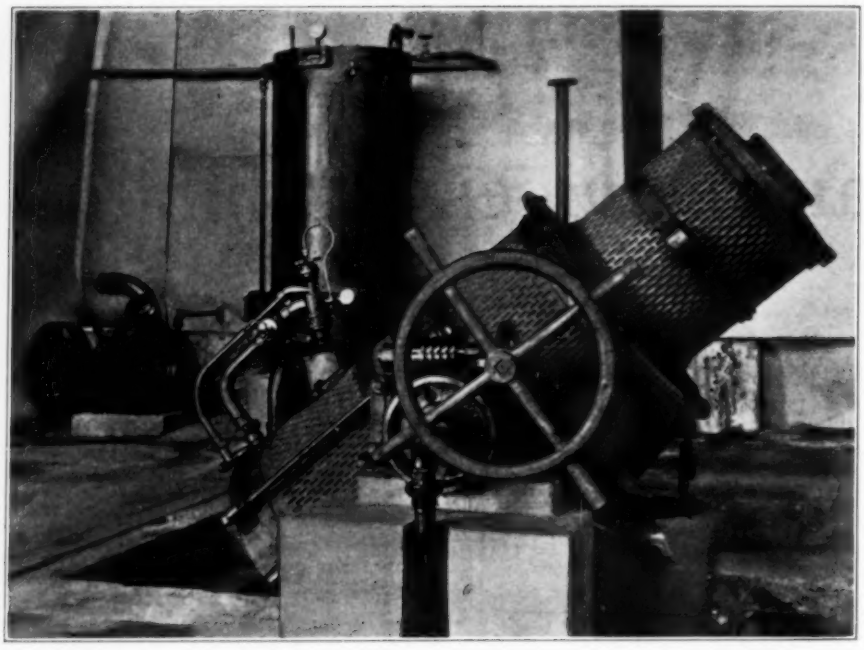


FIG. 2—OIL-FIRED FURNACE IN WHICH THE REFRACTORY LINING IS ENCLOSED IN A PERFORATED STEEL SHELL

tents. After the ladle is filled two men adjust an ordinary shank or bail on the ladle and carry it away from the furnace. The body of the furnace is removable and since the lining is rammed in place around a form, all joints are eliminated.

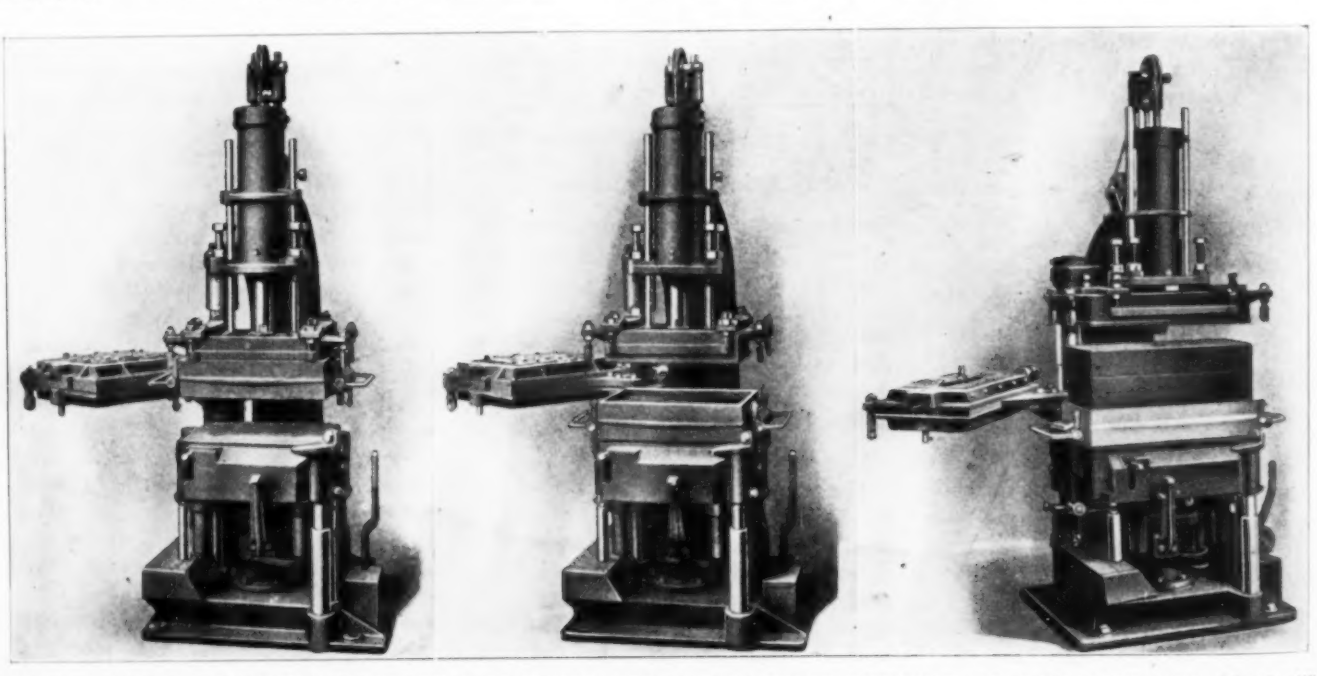
Use Low Grade Fuels

Important changes have been made in the method of firing core and mold ovens in recent years. Development has been forced by the necessity of using low grade fuel more especially lignite, or brown coal, instead of the high grade coal and coke formerly employed, but which practically are off the market now. Special firing chambers, grates and auxiliary equipment are required to successfully use this fuel on account of the high moisture content of approximately 60 per cent. In practical plant operation firing chambers designed by Voith & Huttenes & Oehm are widely employed in German foundries for heating permanent and portable drying ovens.

The design shown in section in Fig. 6 is arranged as a portable drying stove for the combustion of brown coal and is made up of two combustion chambers. The brown coal slides down the inclined grate in the combustion chamber *B* Fig. 6 where it receives a preliminary drying before it is burned to a finish in the combustion chamber *C*. On account of the height of the fuel bed it is apparent that a large quantity of carbon monoxide gas will be liberated in the main combustion chamber and will pass together with the low temperature distillation gases into the finish combustion chamber *C* through the narrow slots *D*. In the finish chamber the gases flow past the refractory bricks *G* which are arranged herringbone fashion with the apex meeting the inflowing gas stream. The gas forms numerous eddies among the brick work and subsequently is burned through the action of a jet of compressed air supplied through the pipe *F*. The compressed air is preheated in the double walled connecting socket *E*. The heated gas from the combustion chamber *C* passes in the direction indicated by the arrow and is conveyed through a suitable pipe connection to the mold that is to be dried.

Molding Machines Shown

Molding machines both of foreign and domestic design were exhibited in considerable numbers. Next to the American machine made by the Tabor Mfg. Co., Philadelphia, with which American foundrymen are familiar, the machine that attracted the most attention was one made by Zimmerman and shown in Figs. 3, 4 and 5. The design of the machine differs in many respects from all standard types. The only points it has in common with



FIGS. 3, 4 AND 5—SUCCESSIVE VIEWS OF A SQUEEZER MOLDING MACHINE DESIGNED TO RAM COPE AND DRAG AT THE SAME TIME AND THEN EJECT THE COMPLETED MOLD FROM THE FLASK

a few machines are that the pattern plate is attached by a swinging connection to a side rod, both cope and drag are formed before the complete mold is removed from the machine table, and the molds are made without flasks. The machine is power operated and in that way differs from a hand-operated machine made by the Vereinigste Schmirgel & Machinenfabriken, A. G., Hannover-Hainholz exhibited at last year's convention and exhibition and described at some length in the April 15, 1922, issue of THE FOUNDRY.

The position of the pattern plate in relation to the height of various drags, the stroke of the ram and the height of the squeezing plate may be adjusted within comparatively wide limits. While operating the machine, two levers must be worked simultaneously and for that reason the operator runs no risk of injuring his hands. The machine is provided only with a single pillar and a complete mold is made with eight operations.

In practice the cope half of the flask is placed on the upper face of the pattern plate while it is swung to one side as shown in the various illustrations. The drag half of the flask is placed on the table of the machine. Both halves are filled with sand, and then the double faced pattern plate is swung toward the center until a suitable stop locates it directly above the drag half of the flask. The action of bringing the pattern plate into position releases the clutch controlling the plunger or ram and the drag, pattern plate and cope are raised and squeezed against the upper plate provided for that purpose.

Mold Pushed Out of Flask

At the upper limit of the stroke the pattern plate and cope are clamped to the squeezing head while the drag is lowered back on the table. The pattern plate then is lowered and swung to one side after which the drag once more is elevated until it comes into contact with the cope. The clamps holding the cope suspended from the squeezing plate are released and the two parts of the mold are lowered to the first position. Here the flask is clamped to suitable anchors while a plate in the table is pushed up by a ram. The sides of the flask are tapered and the body of sand comprising the mold is pushed up clear of the flask. It is lifted away and placed on the floor and the operation is commenced over again by filling the drag flask with sand and placing the cope flask on the pattern plate. Many other interesting machines of new design were shown in the section devoted to molding machinery including a disintegrating and mixing machine for preparing green sand for the use of the molders, also a small appliance for mechanically blacking the face of a mold rapidly and uniformly. An ingenious machine was shown for making pipe bend cores; another electrically operated, jar-ram, rollover machine was shown in action and a hand-operated molding machine was on exhibition designed for producing delicate hollowware in green sand molds. A small hand-operated squeezer machine using an aluminum snap flask approximately 16 x 11¾ x 8 inches is credited with turning out a complete mold every 60 seconds.

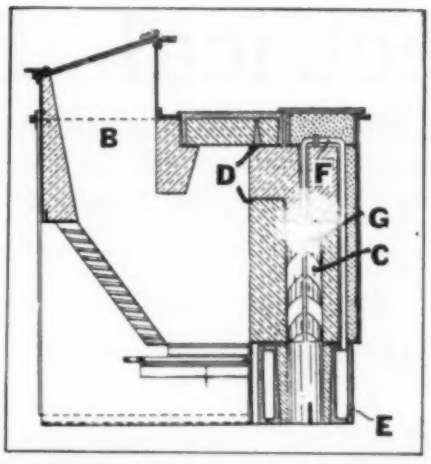


FIG. 6—SECTIONAL VIEW OF HEATER DESIGNED TO BURN BROWN COAL, OR LIGNITE

In view of the great lack of iron and other metals in Germany and the necessity of conducting foundry operations on a most economical scale it was only natural to find that equipment designed to reclaim metal from foundry waste was shown quite extensively. One machine depending on mechanical construction to enable it to function, closely resembled a machine that is made by the W. W. Sly Mfg. Co., Cleveland. Several types of electromagnetic separators were represented.

FIG. 7—A POPULAR TYPE OF GERMAN MAGNETIC SEPARATOR WHICH IS PORTABLE

One design shown by Steinert is illustrated in Fig. 7 and consists of a rotating drum provided with stationary magnets, a shaker trough which distributes the material uniformly over the drum and an oscillating riddle under the drum for removing the sand and other foreign matter from the recovered iron. Devices of this and somewhat similar construction have been placed in operation in German foundries on an extensive scale during the past few years.

Opens New Office

The Pawling & Harnischfeger Co., Milwaukee, has opened a new office at 1124 Book building, Detroit, Mich., James Van Buskirk is in charge. The company has appointed N. B. Norris as manager of its New Orleans office, located at 938 Whitney-Central building.

Flask Company Moves

The Michigan office of the Truscon Steel Co. has been moved to the company's new building at 615 Wayne street, Detroit. The office includes a service organization and engineering department. The general advertising department of the company is located on the same floor as the Michigan office.

Lists Foundry Equipment

The Hanna Engineering Works, Chicago, manufacturer and distributor of Mumford molding machines, has completed a catalog describing air squeeze and jolt machines with their latest improvements. The apparatus listed is elaborately illustrated and diagramed. The various designs are adapted to particular foundry work. Other types of pneumatic foundry equipment described are pattern draw machines, an unbalanced vibrator, tripod shakers, suction oilers and pneumatic hoists and trolleys. Sprue cutters for cutting the gates and risers from castings and mold dryers for skin drying large molds also are illustrated. The jolt valve used in some of the machines and other parts are patented.

A $6000 enameling building will be erected at the plant of the Favorite Stove & Range Co, Piqua, O., to take care of growing business. The building will be 43 x 68 feet.

Opens Electrical Exposition

Association of Iron and Steel Electrical Engineers Assembles Wide Range of Equipment Vital to the Operation of Furnaces, Mills and Foundries

ELECTRICITY'S growing importance to the manufacturer of castings was recognized by the Association of Iron and Steel Electrical Engineers, which opened its technical sessions and exhibition at the Broadway auditorium, Buffalo, Sept. 24. With a 1-ton electric furnace as a nucleus, manufacturers of foundry equipment were interested to the point of contributing the main and auxiliary machinery and equipment necessary to a complete, small operating foundry for producing steel tractor shoes used on the crawling type tractor made by the Cleveland Tractor Co., Cleveland. This foundry was under direction of E. P. Langworthy, manager, and J. H. Scully in charge of molding. These operating executives, three molders and four laborers composing the force in charge of molding, pouring and shaking out are connected with the Buffalo steel foundry of the American Radiator Co.

Cores were supplied from the plant mentioned, but the molds actually were made on two jolt squeezer molding machines, provided by the Osborn Mfg. Co., Cleveland, in flasks manufactured by the Truscon Steel Co., Youngstown, O. Compressed air was supplied for the molding machines by a compressor made by the Worthington Pump & Machinery Corp., New York. The sand employed was a standard steel grade produced by the Venango Sand Co., Franklin, Pa., mixed in a 6-foot pan, muller-type mixer, furnished by the National Engineering Co., Chicago.

These molds were placed on steel channel frames, six molds to a frame and assembled to be poured with metal melted in a 1000-pound, direct arc type, furnace installed by the Pittsburgh Electric Furnace Co., Pittsburgh. A 5-ton crane erected by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., served the pouring floor and operated over the pouring pit where three ladles, supplied by the Whiting Corp., Harvey, Ill., were provided to take away the metal. These ladles were preheated by a ladle heater made by the Mahr Mfg. Co.,

Foundry Sessions

WEDNESDAY, Sept. 26, was set aside by the Association of Iron and Steel Electrical Engineers for the discussion of foundry operating problems with especial reference to the use of electricity. The Complete Electrification of the Foundry by L. W. Egan, Ohio Steel Foundry Co., Lima, O., and Electrical Furnace Phenomena, by E. T. Moore, Halcomb Steel Co., Syracuse, N. Y. engaged attention at the morning and afternoon sessions respectively. R. B. Gerhardt, Bethlehem Steel Co., Sparrows Point, Md., addressed the opening session on Monday morning and the exposition was opened formally by Mayor Frank X Schwab at 2 o'clock in the afternoon.

ELECTRICAL OPERATING EQUIPMENT, SUPPLIES AND SUNDRIES FEATURED THE BUFFALO EXHIBITION

Minneapolis. The crane was equipped with a special rig for lifting the platforms on which the molds were placed and removing them to the shake-out. A lifting magnet was available to remove the castings from the sand.

An annealing furnace made by the George J. Hagan Co., Pittsburgh, was installed to anneal the castings; two heats per day at 1600 degrees Fahr. forming the task alloted to this furnace. The castings were placed in the furnace in a special nickel-chromium alloy box made by the Ohio Steel

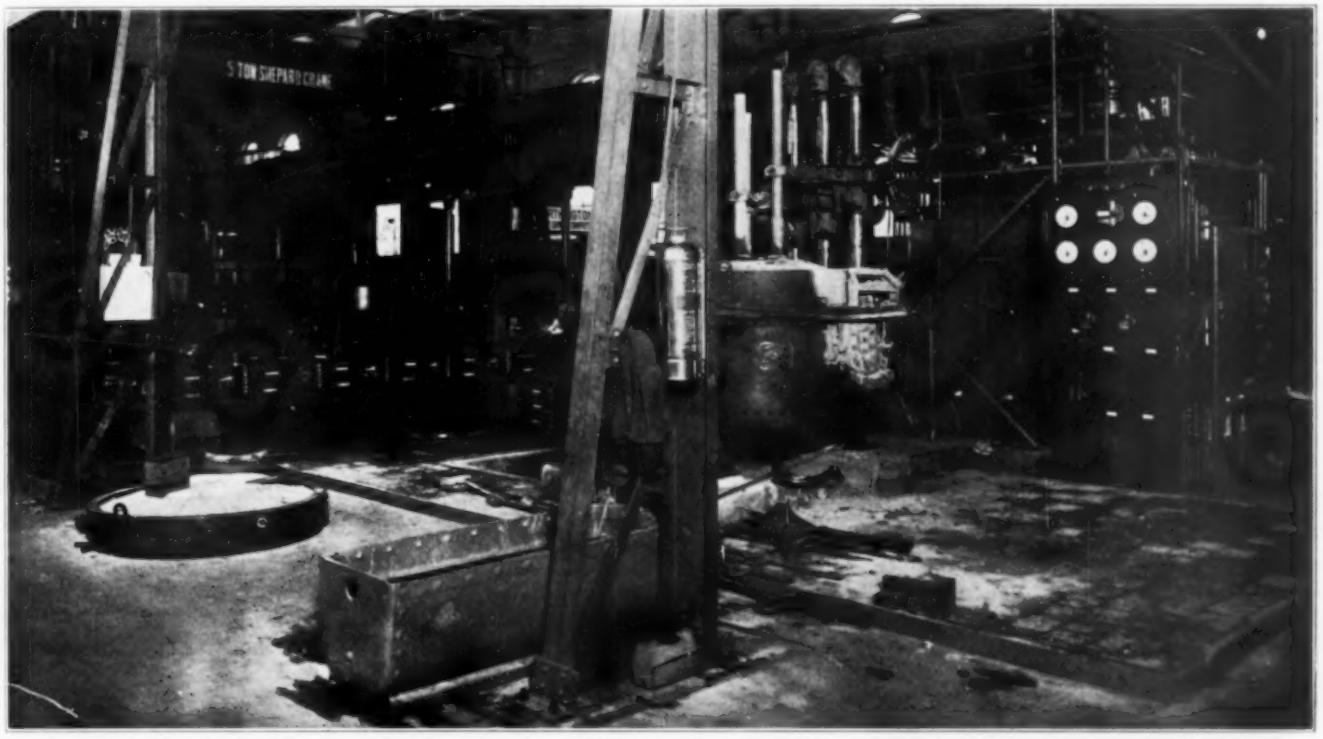
lations operated during the convention.

Auxiliary equipment used in the foundry section included electrodes for the furnace, by the Atchison Graphite Co., Niagara Falls, N. Y., weighing scales for the charges by the Buffalo Scale Co., Buffalo; transformers by the Pittsburgh Transformer Co., Pittsburgh; and chipping hammers and grinders by the Cleveland Pneumatic Tool Co., Cleveland.

Equipment shown at the Buffalo show varied from the power generating units such as hydroelectric units

efficiency of certain units. It also displayed reversing magnetic control systems, heavy duty direct current mill drive motors, inside and outdoor types of lighting arresters and protective panels for cranes, which occasioned much interest from operating executives.

The Westinghouse company displayed full size units of steam turbine generating equipment, mill motors, steel mill operating control panels, squirrel-cage type induction motors, and the various types of lamps recommended



ONE CORNER OF THE HALL WAS DEVOTED TO A SMALL FOUNDRY COMPLETE WITH MELTING, MOLDING, HANDLING, ANNEALING AND FINISHING EQUIPMENT

Foundry Co., Lima, O. This was charged by a special fork-type, elevating truck made by the Automatic Transportation Co., Buffalo.

A complete welding room with a portable arc welder made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., was available for such castings as required this treatment. The Bridgeport Safety Emery Wheel Co., Bridgeport, Conn., provided snagging wheels with operators for grinding the castings, two direct-connected double wheel units comprising the installation.

Immediately adjoining the grinding section was a complete sand-blast installation erected by the Pangborn Corp., Hagerstown, Md. This included a sand-blast barrel, a table-type sand blast, drying and abrasive reclaiming equipment, and a dust arrester. Metallic abrasive, marketed by this company, was in use in the sand-blast instal-

and steam turbine driven generators to small solderless line connections, fuses and lamp maintenance equipment. Over 100 manufacturers were represented and demonstrated their products either through full size operating devices, models or photographs. An effort was made on the part of the large producers of electrical equipment to acquaint their interested followers, the electrical engineers of the iron and steel industry, with the less familiar and in many cases small but important units of equipment. This was particularly noted in the displays offered by the General Electric Co., Schenectady, N. Y., and the Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

The former company showed and demonstrated high power lamps for industrial lighting, lamps designed to resist the stress of jars and rough handling, and compared the lighting

for industrial service. Auxiliary equipment, such as indicating and control pyrometers and rheostat control for ovens and heat-treating furnaces also were shown.

The Electric Controller & Mfg. Co., Cleveland, showed starting switches, controllers of various types, and a new manual automatic compensator operated in connection with a motor. An exhibit of this company which attracted considerable attention was a motor operating in a glass enclosed box containing a quantity of cement which was agitated and stirred by a fan attached to the shaft of the motor. This was intended to demonstrate the protection of working parts from damage by dust and abrasive materials in the air.

Cutler-Hammer Mfg. Co., Milwaukee, through a system of charts containing parts or units of the devices described, demonstrated its various

products such as equipment for metering air and gases, industrial heating and soldering devices, clutches for different drives and electric magnets. A dis-assembled unit of the type of lifting magnet made by this company was exhibited to show the trouble-proof and protective features of construction.

Moving the Product

Material handling and transfer received a larger share of attention than was noted in previous exhibitions of the iron and steel group. Cranes and hoists with their control elements were largely in evidence, and the growing importance of storage battery trucks in this class of service was evidenced through the number of manufacturers of this class of equipment who were represented.

The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., displayed in its exhibit space a cage controlled monorail-type hoist and various other units, in addition to its operating exhibit.

The Alliance Machine Co., Alliance, O., had small operating models constructed of aluminum which served to show the working of ladle and soaking-pit cranes, stripping cranes, bin storage systems, and a practical car dumper.

Different types of storage battery trucks, comprising elevating platform units, fork-type, furnace charging units, tractor and crane-type trucks with others designed for special industrial service were shown and in many cases were in operation on the floor of the exhibition hall. Those who were represented in this class of equipment included: Automatic Transportation Co., Buffalo; Baker, R. & L. Co., Cleveland; Elwell-Parker Electric Co., Cleveland; Lakewood Engineering Co., Cleveland, and the Mercury Mfg. Co., Chicago.

The contribution of the foundry industry to the operating necessities of the iron and steel industry was shown by the number of castings manufacturers present at the show. The Stroh Steel Hardening Process Co., Pittsburgh, showed a number of large gears, wabblers, roll pinions and special rolls made by a method which gives a glass hard wearing surface to a soft steel core casting. This process involves painting on a layer of a special alloy within the mold before the molten steel is introduced, the heat of the metal fusing and producing a reaction which is said to result in a wearing surface too hard to be machined. W. P. Taylor & Co., Buffalo; Farrell Machine & Foundry Co., Ansonia, Conn.; Tool Steel Gear & Pinion Co., Cincinnati, and R. D. Nuttall Co., Pittsburgh, exhibited gears and other castings, while the Chapman Valve & Mfg. Co., Indian Orchard, Mass., displayed valves and test pieces from various metals employed in the manufacture of the valves.

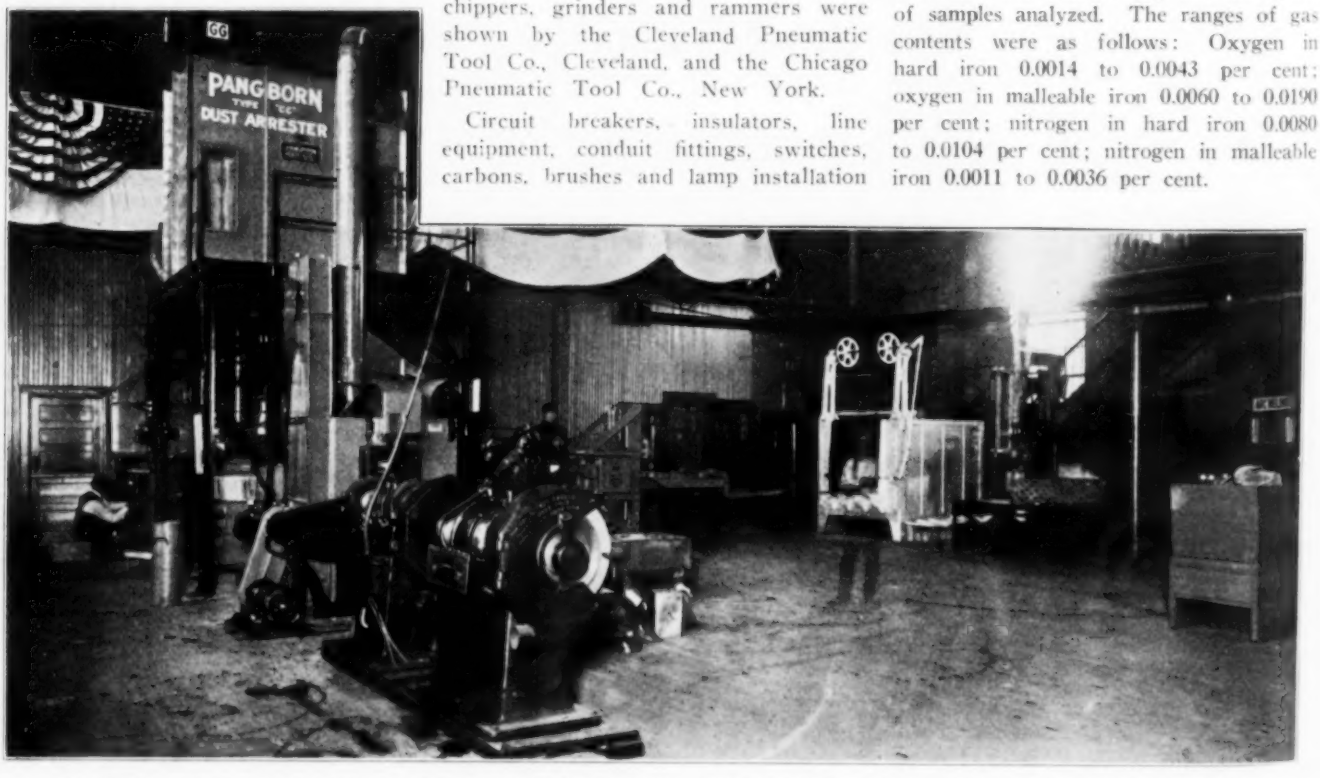
Small pneumatic tools, such as drills, chippers, grinders and rammers were shown by the Cleveland Pneumatic Tool Co., Cleveland, and the Chicago Pneumatic Tool Co., New York.

Circuit breakers, insulators, line equipment, conduit fittings, switches, carbons, brushes and lamp installation and maintenance devices were shown by various companies, including the Appleton Electric Co., Chicago; Corliss Carbon Co., Bradford, Pa.; Delta Star Electric Co., Chicago; Mutual Electric & Machine Co., Detroit and Square D Co., Detroit.

The Hayward Co., New York, exhibited an electrically operated clam-shell bucket. The MacLeod Co., Cincinnati, showed photographs of sand-blast installations and the Spencer Turbine Co., Hartford, Conn., demonstrated low-pressure turbo compressors suitable for cupola operation and similar work.

Analyses Malleable Iron Gas Contents

Analyses for oxygen, hydrogen, and nitrogen have been completed by the bureau of standards on samples of hard white iron and malleable iron from two plants melting in electric furnaces and from these plants melting in air furnaces. In all cases it was found that the annealing of the hard iron increased the oxygen content of the metal and decreased the nitride nitrogen content. No distinction between air furnace and electric furnace iron was found on the basis of the oxygen content or on the basis of the changes in oxygen or nitrogen. There was apparently in some instances a tendency for electric furnace iron to contain more nitrogen than air furnace iron in both hard and annealed conditions, but this difference was not true throughout the series of samples analyzed. The ranges of gas contents were as follows: Oxygen in hard iron 0.0014 to 0.0043 per cent; oxygen in malleable iron 0.0060 to 0.0190 per cent; nitrogen in hard iron 0.0080 to 0.0104 per cent; nitrogen in malleable iron 0.0011 to 0.0036 per cent.



PRACTICALLY ALL OF THE EQUIPMENT IN THE MODEL FOUNDRY WAS ELECTRICALLY OPERATED AND THE USE OF ELECTRICITY IN WELDING WAS DEMONSTRATED

Dispenses With a Cope Flask

Pattern Was Cambered to Compensate for Unequal Contraction and a Number of Flat Cover Cores Were Employed to Take the Place of the Usual Cope

BY J. H. EASTHAM

METHODS for producing any given casting in quantity cannot be applied where only one or at least a limited number are orders and of course the opposite also is true. Methods adopted for producing a single casting would be entirely out of place in a continuous program. However, single castings are ordered occasionally and the foundryman is forced to adopt emergency measures. Plan and sectional views of a paper box machine frame casting 14 feet 6 inches long, 3 feet 5 inches wide and 7 inches deep are shown in the accompanying illustrations. The casting weighed 1600 pounds and was ordered by a regular customer whose castings usually were much smaller, but ordered in considerable quantities and almost invariably in a hurry.

The pattern and corebox were delivered to the foundry on Saturday with a request that the casting be included in a shipment the following Wednesday at the latest. The customer's plant was separated from the foundry by 30 miles of a metropolitan area containing about 20 well equipped shops willing and ready to take the job and guarantee delivery on the specified date.

For want of a suitable flask the foundryman decided to bed the pattern in the floor and cover the mold with a number of slab cores. The patternmaker had provided no camber on the pattern and therefore the task of turning out a straight casting depended on the skill and judgment of the foundryman. The pattern was perfectly straight and was provided with the usual machining allowance plus contraction. One lightening corebox provided with a stop-off piece was designed to form all the cores. The customer's machine shop superintendent accompanied the patterns and after sizing up the facilities indulged in the customary skeptical persiflage which characterizes the meeting of East and West in the shape of machine shop and foundry superintendents. The foundryman appeared to have a shade the best of the argument. He borrowed a chew of tobacco, a blueprint and told his friend he intended to make the casting without a flask of any kind.

Dug Pit in Floor

For the first time in the history of the shop a pit was dug in the floor about 16 inches longer and wider than the pattern. In the process of bedding the pattern in the floor, the sand was rammed a little softer under the ends than it was in the center. Before the parting was made the ends of the pattern were pounded down approximately 3/16-inch to counteract the tendency of castings of this character to spring at the ends while cooling. This amount of allowance was simply a guess but in this instance it served to produce a straight casting.

On Monday a molder and helper made the mold and blacked it preparatory to assembly on the following day. Runner cores were located in position at the four lower corners before the sand was rammed around the pattern. One coremaker made the ten main cores on Monday, also the few 18 x 12 x 2-inch flat cores required to supplement the ordinary stock of these cores usually kept on hand. The cores were blackwashed before they were dried and therefore they were ready to place in the mold about 2 hours after they were taken out of the oven and allowed to cool.

Core prints were cut through both top and bottom, obviating the necessity of using chaplets. Pinches of flour on the top prints assured a hard *touch* when the covering cores were placed in position. Special cores with a ¼-inch ridge to form the machining clearance along the section marked *AAA*, were set first and the others were arranged accordingly.

The cover cores were held in place by a number of clamps placed longitudinally and these in turn were secured by a number of weights set in such a manner that the ends rested on supports clear of the mold. Wedges were inserted between the weights and the clamps. The casting was poured from two ladles as shown in the sectional and plan view Fig. 1. The finished mold is shown at the left and the mold with the pattern in position at the right. The casting was stripped and cleaned in four hours Wednesday morning and was laid down on the customers receiving platform at 4 p.m. the same day, one hour ahead of the time limit. Every person interested in the job appeared to be

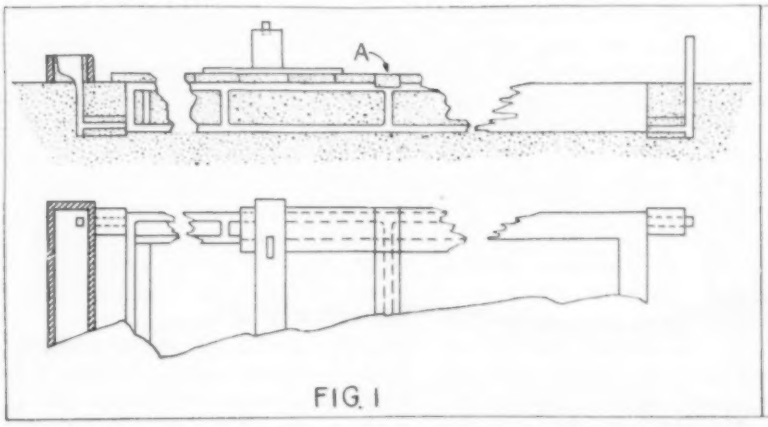


FIG. 1

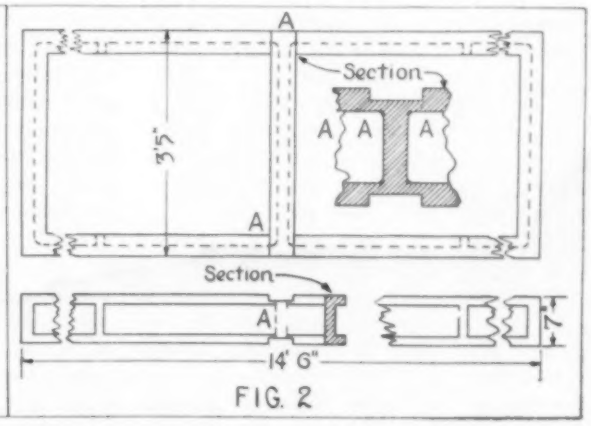


FIG. 2

FIG. 1—PLAN, ELEVATION AND SECTIONAL VIEWS OF CASTING FIG. 2—COMPOSITE PLAN AND SECTION—LEFT—FINISHED MOLD—RIGHT—PATTERN RAMMED IN MOLD

quite pleased with the single exception of a certain individual, his friend from the machine shop.

Patents Repetition Mold Construction

Patent 1455353 has been granted Clifton Pettis, New York, covering mold construction. The mold is designed to allow for the expansion of the mold and to permit the gases to escape without any flow of metal through the vent holes. The coefficient of expansion of the refractory mold is compensated for by spacing the pieces of the mold. This also permits the gases to escape. However, the spaces are so small that the metal does not penetrate them.

Special Rigging Required by Soil Pipe Parts

Question:—Could you give us some information on the proper method for casting soil pipe fittings. We have been unable to find any person in this part of the country familiar with the subject and will appreciate any advice you may care to impart covering the practice of foundries engaged in the manufacture of this class of castings.

Answer:—Special shapes, elbows, bends, tees, etc., are made on stripping plate machines on which the molds are

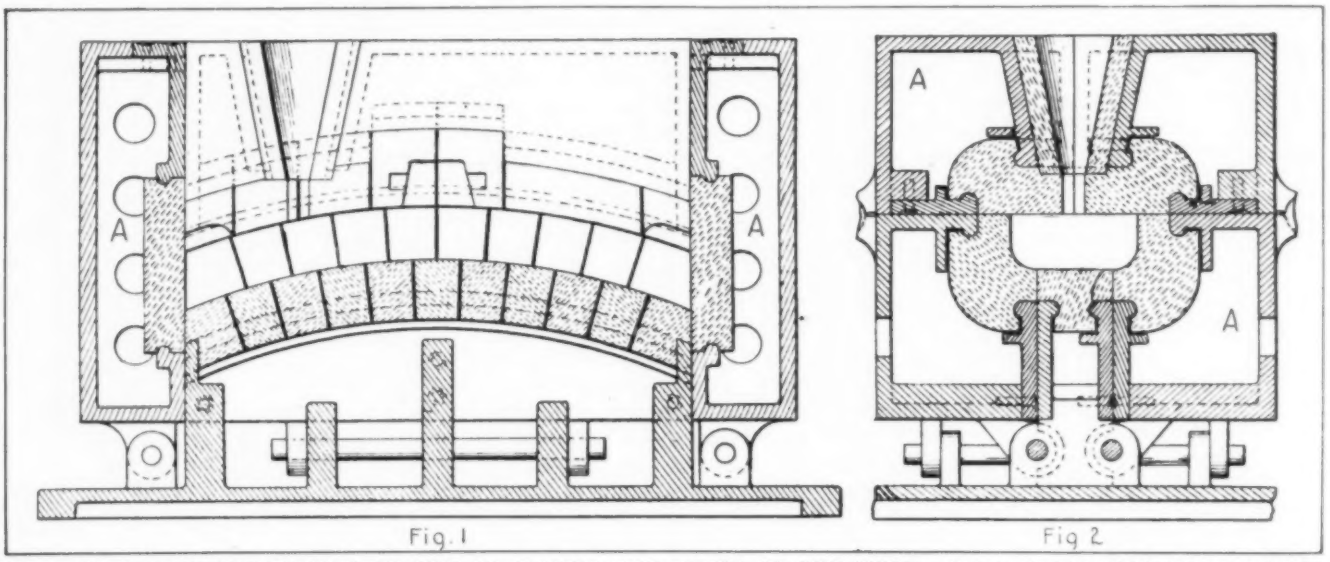


FIG. 1—EXPANSION IS COMPENSATED FOR BY SPACING THE PIECES OF THE MOLD. FIG. 2—CROSS SECTION OF A MOLD FOR BRAKESHOES

The frame of the mold is made of iron and consists of four sides, each hinged to the cast iron base, so that when vertical they form a closed box. These may be locked at the top. Each carries a corresponding part of the molding receptacle which are designed to lock together in the manner shown in accompanying illustrations. The outer walls of the frame are perforated to enable the air in resulting chamber *A*, between the outer walls and the mold, to have free circulation.

The mold itself is constructed in sections and can be made of a refractory or metal. As many pieces are used in the mold as are necessary to compensate the maximum expansion of the refractory. The foundation consists of refractory bricks held by a key rod, and spaced. By means of the spaces in this design of mold any form of riser or venting gate is eliminated. In the accompanying diagrams the mold is shaped to cast brake shoes for railroad wheels, but the frame may be used for any shape of mold suitable to its size with a newly designed mold, consisting of numerous pieces, but forming a different design.

rammed by hand. This applies particularly to the smaller sizes in which the cores are made in individual hinged coreboxes. In the larger sizes, shell patterns which serve for both pattern and corebox, are employed and they are molded on the floor in the same manner as any other ordinary 2-part job. The iron flasks employed are made from special patterns which conform closely to the outer contour of the castings to be made in them

It is necessary to ram the sand with a considerable degree of skill and judgment. If it is not rammed hard enough the castings will strain and come out over weight and if it is rammed too hard the molten metal will not lie against the face of the mold. In either case the resulting castings are scrap. The tempering of the sand also requires the closest attention. If it is too dry the molds will not lift satisfactorily from the pattern plate and if it is too wet the iron will not lie against it. The usual practice is to ram the molds with the handle of the shovel. The stripping plate machines on which the smaller patterns are molded usually are mounted on wheels so that they may follow the diminishing sand heap as the day's work progresses. Where a sand conveying equipment is installed the machines may remain stationary. In some instances it is customary for a molder to make both molds and cores; in others one man makes the molds and a second makes the cores and in still other instances one man makes the cores for two or more molders.

Cores for the straight lengths are swept in green sand on cast iron barrels, but on account of the special fittings this method cannot be applied and therefore it is necessary to provide individual coreboxes for each shape. Cast iron, hinged coreboxes are used for this purpose. The larger sizes the coreboxes which also serve as patterns are not hinged, but are split horizontally in the center and provided with dowels and dowel pins like those in any 2-part pattern.

Chaplets cannot be employed to support the green sand cores on the bottom or to prevent them from floating under the pressure of the molten iron. The core arbors are designed in a manner to resist this pressure. In some cases the sand above the core print in the cope is sufficient to hold the core in its place. In others part of the arbor is made to project through an opening, in the side or end of the drag at the joint line. After the cope is set on the point of a thin wedge is driven between the edge of the iron cope side and the wing on the arbor.

With the hinged corebox, the clay washed arbor is set in to what is destined to be the drag half of the core. Sand is thrown in and packed firmly with the fingers. The other half of the

corebox also is packed full of sand, but no arbor is employed. After both halves are filled they are scraped off flush with the joint. Then they are brought to a vertical position, both halves slowly closing as they approach each other. Upon touching, the complete box is lowered back on the bench with the half containing the arbor underneath. The top of the corebox then is rolled back and the core is lifted out and placed in the mold.

In making a mold and core from one of the larger pipes the practice is slightly different. The first step is to place one half of the pattern on a rollover board. It will not do to place either half indiscriminately. The core arbor will fit only one half of the pattern and that is the half which must go in the drag. Where follow boards are provided to fit each pattern the molder cannot make a mistake, but in many cases only plain flat rollover boards are available.

After the drag is rammed and rolled over, a parting is made including hollows scooped out at each opening in the pattern to serve as core prints. Parting sand then is thrown on followed by a little sand through a riddle after which the arbor is set in and sand rammed up to the parting line in the mold. The top half of the pattern then is set in place on the lower half and then sand is introduced through the open ends of the pattern. The sand is packed firmly, but not hard. The cope is set on next, rammed and lifted off. Then the top half of the pattern is removed after which the core is lifted out and set down while the lower half of the pattern is being withdrawn and the mold finished. The core then is replaced, the cope set on and after the flask is clamped and the arbor wedged the mold is ready for pouring. The castings are dipped after being cleaned.

Desire To Standardize Patternmaking

BY B. RUPERT HALL

THE pattern shop alone of all the production divisions, shares with the engineering department the responsibility for displaying creative power. It is for this reason perhaps that most modern pattern shops are not operated on a more strictly production basis. In the average shop, each patternmaker to a great extent is allowed to exercise his own judgment in constructing a pattern. Comparatively little effort is made to supervise processes or to systematize methods. As a result, efficiency has suffered somewhat although not as much perhaps as would have been the case in some other branch of craftsmanship. The result of the system in vogue apparently has been to raise the standard of workmanship on the part of the individual artisan, and, just on account of this prevalent capability on the part of this individual, the present system has been fairly satisfactory although wrong in theory. The patternmaker has preserved more than any other production trade the tradition of individual all-around skill. One cannot help noticing and conceding this fact. The writer has come into contact with many types of shop men representing every trade. It has been a constant source of wonder to him how consistently high the standard of intelligence and able initiative is as displayed by patternmakers generally.

However, the foregoing statements do not mean that the present day pattern shop can not bear some revision to good advantage for there is plenty of room for improvement. There is, indeed, a certain tendency in the direction of constructive change, marked by a constantly increasing effort to separate the work of planning from the manual construction of patterns. Such a change in method will introduce a tendency to specialize with a corresponding decrease in all-around proficiency; a rather undesirable feature. However, the efficiency of production, the improvement of which is the ultimate goal of modern engineering science, is bound to be greatly increased.

The proper construction of patterns is a matter of the most vital importance to any manufacturing plant. An error when making a pattern which is to be used in large production will inevitably cause a serious monetary loss. Fully as serious an error, and just as costly, is the use of patterns which, while they may be properly designed mechanically, are poorly designed with respect to later operations needed in manufacturing and machining the castings. In cases of this kind, a few words of criticism from a competent advisor offered while the design was taking form would have resulted in alterations by which a great saving might have been made. These are the conditions under which the engineering department and the pattern shop should establish closer contact. If the co-ordination between the engineer and the patternmaker were close enough, most serious errors would be avoided and a great deal of the trouble at present encountered in the machine shop and on the assembling floor would be eradicated.

It is generally conceded that the proper place to determine the method of making a pattern is in the engineering drafting room. However, the average designer or checker cannot be expected to be a specialist in every branch of production methods. About as much as can be required from the machine designer is that he be able to create a satisfactory mechanism for the purpose in view, that he be able to design strong practical parts to function in this mechanism, and that he possess a good fundamental knowledge of shop production methods. Now, this last mentioned qualification has its definite limits and when it comes to the refined detail of pattern construction, a specialist is needed.

The logical way to take care of this requirement is to obtain a man, well informed as regards both pattern shop and foundry practice and to station him in the drafting room to check all pattern drawings before they are issued to the shop. He is thus in a position to change any expensive features in the original design of the casting. At the same time, he can plan the method of constructing the pattern and coreboxes, if any are required, thus removing the necessity for doing this later in the pattern shop. It would then appear that the logical person for this position is one familiar with both pattern and foundry practice. The efficient patternmaker is constantly studying and devising means of doing work expeditiously both in the pattern department and in the foundry.

There can be little doubt that a definite method of co-operation between the engineering department and the pattern shop, as outlined, would vastly improve the results obtained at present. That this opinion prevails generally is shown by the action of up-to-date concerns in experimenting with such arrangements. The writer believes that the relation between the engineering department and the pattern shop can be aided by indulging in more systematic methods, organizing these two departments so as to function as one in the matter of planning.

The author, B. Rupert Hall, is superintendent of the pattern laboratory, University of Illinois, Urbana, Ill.

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Scattering Output Business Insurance

WHEN a financial or industrial crisis occurs in our history, economists generally attribute it at least in part to over production. However, a satisfying definition of what over production actually means never is forthcoming. When account is taken of the millions who are in want, particularly during the period of depression induced by this alleged over production, the term appears to be a misnomer.

The close association of the foundry industry to most others is recognized and in the past the state of castings demand was used as a barometer of general business conditions. A similar use at the present time without many exceptions or omissions, would be deceiving. For example, aluminum castings are consumed in a great aggregate poundage in constructing automobiles, and the aluminum industry is to some extent dependent on the automotive industry. Again, nickel until recently has been consumed mainly by armor plate manufacturers, and the only possible result is a simultaneous ebb and flow in the prosperity of both, governed by the demand for that commodity.

Thus, specialization, in many cases, assigns the total production of a huge plant to be consumed in another industry. A temporary slack means that both the producing and intermediate or consuming industries are shut down; where, if the producing plant had divided its production among different industries, it might have escaped the ill fate of its one customer. The officials of the producer plant, bewildered by a large stock of special castings, mistakenly blame over production.

When it is recalled that over production means that all conceivable needs for a specific commodity or industrial product have been satisfied, and the apparent insatiability of human wants is observed, it is clear that the cause may have been analyzed incorrectly. If, before manufacturers plan their production with the enormous expenditure and equipment involved, they consider the nature of their market and the possibilities of disaster to a single outlet, many financial calamities may be prevented. Poor distribution and not over production is the only agency to which restricted outlet logically may be traced.

The foundry industry should profit by the precedents that illustrate this principle. A tendency to specialize, strongly in evidence in nonferrous lines is noted and future progress probably will demand even more narrow limits as to kind and greater quantity manufacture of a few commodities.

When foundries pioneer for new fields, the only secure procedure is to ascertain if a market has been developed or if different classes of consumers actually exist so that the variety of demand will assure continued operation if one or more particular lines become stagnant. To start a foundry for making castings, the need for which is limited to a single consumer is a serious risk, and if undertaken at all, the returns should carry the burden.

The conclusion from financial precedent is that the only way to stabilize an industry is to creat a variety of methods of consumption for its products so that if one or more sources of demand are lost, the remainder will be sufficient to carry the industry until additional needs are found for the products. Although the purpose of business is to meet every demand of the market, the industrial concerns which follow this sound principle, whether by choice or by destiny, will be found to be among those answering the roll call after an industrial or financial crisis.

Trade Outlook in the Foundry Industry

SEPTEMBER, usually accepted as the turning point in the year's business cycle, has been passed with every evidence of better conditions ahead. Heavy railway shipments, incident to crop movements, intensified coal buying and the shipment of large stocks of goods which will supply retail requirements for the remainder of the year, all indicate alike the large consumption of commodities and the desire of the public to purchase where the need exists and prices are satisfactory. The latter consideration seems to be the crux of the industrial problem. Many manufacturers compare profits with the post-war era and become discouraged at the showing.

Feel No Apprehension

While the volume of business coming to foundries is not exceptionally heavy steadily repeated small orders serve to maintain operations. The margin between costs and selling prices is not large and economy is necessary to show profit. Some, for this reason, are inclined to pessimism; but a comparison of present conditions and prospects with those which existed previous to the 1920 depression or in the prewar days, rather than with the days of exceptional prosperity which followed the war, gives no reasonable basis for fear of the future. Buying closer to immediate requirements is common to all lines. It is evident in the orders for jobbing castings even on production work. The same tendency is present in orders for pig iron, for semifinished steel and for other materials required for industrial uses. Therefore, no large accumulation of stocks is possible, inventories are lower and many factors which induce a depression are lacking. Uncertainty as to prices is responsible in some measure for hand-to-mouth buying, and heavy production assures the buyer of service when he needs goods purchased for quick delivery.

Prices of Raw Material for Foundry Use

CORRECTED TO SEPT. 27

Iron		Scrap	
No. 2 Foundry, Valley	$25.00	Heavy melting steel, Valley	$17.50
No. 2 Southern, Birmingham	21.00 to 23.00	Heavy melting steel, Pitts.	17.50 to 18.50
No. 2 Foundry, Chicago	26.00	Heavy melting steel, Chicago	16.00 to 16.50
No. 2 Foundry, Philadelphia	25.26 to 26.26	Stove plate, Chicago	19.00 to 19.50
No. 2 Foundry, Buffalo	24.00 to 25.00	No. 1 cast, Chicago	22.50 to 23.00
Basic, Valley	25.00	No. 1 cast, Philadelphia	20.00 to 21.00
Basic, Buffalo	24.00 to 24.50	No. 1 cast, Birmingham	19.00 to 20.00
Malleable, Chicago	27.00	No. 1 cast, Buffalo	19.50 to 20.50
Malleable, Buffalo	24.50 to 25.00	Car wheels, iron, Pittsburgh	19.00 to 19.50
Coke		Car wheels, iron, Chicago	19.00 to 19.50
Connellsville foundry, coke	$5.50 to 6.00	Railroad malleable, Chicago	21.50 to 22.00
Wise county foundry, coke	6.50 to 7.00	Agricultural mal., Chicago	19.50 to 20.00
		Malleable, Buffalo	20.00 to 21.00

Auto Output Steady

Automobile production, an important factor in castings demand and one of the most sensitive indicators of general business conditions maintains an unusually high rate for this season of the year. According to the department of commerce, the August output of automobiles of all classes reached 348,733, an advance of 6.7 per cent over the previous month. Further, with the introduction of new models during September, sales have been maintained upon a basis which enables manufacturers to anticipate requirements of castings for the remainder of the year. During the first eight months of the year, 2,732,000 automobiles were manufactured. The total registration in the country is estimated at 13,000,000 vehicles and manufacturers do not anticipate the saturation point will be reached under a total of 15,000,000 cars. During the past year replacements, that is the purchase of new automobiles to take the place of those finally scrapped, reached a total of about 2,000,000 cars.

Farm Outlook Brighter

With an increase in the price for farm products, implement makers report a buying tendency stronger than has been noted for a long period. Repeated efforts to bring a more diversified production, with a greater variety of crops, are having a marked effect, and the result will be an increased demand for different classes of farm machinery. Stove and furnace foundries are more active and operations in the Detroit district are estimated at 65 per cent of capacity. A shortage of stove molders in Illinois reflects conditions in that region. Railway purchases are limited, but continued high pressure requirements, improved railway operations and higher earnings are expected to bring additional freight car buying. Over 19,000 new freight cars and 272 locomotives were delivered by the manufacturers in August. Malleable operations increased during August, due mainly to the amount of casting business coming from railway car builders. Building operations have slackened with the approach of winter, but a comparison in a number of large centers shows the amount of new construction in the first seven months of 1923 to have been 16 per cent in advance of that noted in a similar period in 1922. Further, stocks of sanitary ware, soil pipe, hardware and building sundries are not large and jobbers supplies have been largely depleted. August bookings of steel castings, according to the department of commerce were 52.1 per cent of capacity, representing a loss of 1.6 per cent when compared with the previous month. However, orders for steel castings for railway service increased from 43.7 to 47.9 per cent in the past month. August foundry operations in Ohio, according to the Ohio State Foundrymen's association were 79.56 per cent, compared with 85.32 per cent for July, marking a decline which was expected and which is due to the regular summer recession in foundry operations. The stocks of pig iron and scrap on hand increased.

Nonferrous Active

Members of the National Association of Brass Manufacturers, makers of plumbing goods, at a recent meeting reported operations good with orders thirty days in advance. Many are working on stock castings in anticipation of future business. In Ohio, nonferrous operations increased from 77.22 per cent of capacity in July to 80.7 per cent in August. Prices on nonferrous metals, based on New York quotations in the *Daily Metal Trade* of Sept. 27 follow: Casting copper, 13.25c; electrolytic copper, 13.50c; Straits tin, 41.75c; lead, 7.05c; antimony, 7.50c; nickel, shot and ingot, 29.00c; aluminum, No. 12 alloy, open market, 21.00c to 22.00c. Zinc is 6.40c, E. St. Louis, Ill.

Comings and Goings of Foundrymen

ROY L. KNEEDLER has accepted the position as foundry superintendent for French & Hecht, Davenport, Iowa. Mr. Kneedler recently resigned as foundry superintendent for the Climax Engineering Co., Clinton, Iowa. Previous to that time he was for 17 years with the Weber Engine Co., Kansas City, Mo., three years with B. T. McDonald, Pitless Scale Co., and five years with the Union Machine Co., Bartlesville, Ok'a. Mr. Kneedler's experience covers 35 years in the foundry business during 20 years of which time he has held positions as foundry superintendent.

O. L. Wark has been promoted to the position of foreman in the foundry of the Canadian Pacific railway, Winnipeg, Man., Canada.

William Davie, formerly with the Toledo Machine & Tool Co., Toledo, O., has been made superintendent of the Peninsula Foundry & Machine Works, Portland, Oreg.

John R. Poyser, who for 12 years was secretary in charge of sales for the Canton Foundry & Machine Co., Canton, O., recently has been made sales manager for Doelger & Kirsten, Milwaukee, manufacturers of alligator shears.

Hugh E. Fulton, president of the Albion Motor Co., Glasgow, Scotland, the oldest British motor truck manufacturing company, has arrived in Montreal, Que., and will make a tour of the manufacturing centers in eastern Canada.

John Brady, for 40 years with the W. A. Jones Foundry & Machine Co., Chicago, and for 30 years foreman in the foundry, has retired and will move to Florida. His retirement was marked by a dinner at the Illinois Athletic club at which he was presented a gold watch by his associates.

John J. Oakley has been made foundry foreman for the H. & H. Foundry & Machine Co., Inc., Stamford, Conn., manufacturer of piano plates and machinery castings. Mr. Oakley previously was employed in Waterbury, Conn., first as a molder and later in an executive position. He has been connected with the industry in Scotland and in Newfoundland where he served his apprenticeship as a molder.

Walter E. Broadbelt recently has been made assistant general manager for the Reading Steel Casting Co., Reading, Pa. Mr. Broadbelt has had a wide experience in steel foundry lines with especial reference to patternmaking, applying molding equipment, and other production problems. He was foundry engineer at various times for the Lebanon Steel Foundry, Lebanon, Pa.; the Michigan Steel Casting Co., Detroit; and Eagan-Rogers Steel & Iron Co., Crum Lynne, Pa.

Dan G. Allebach is now employed as investigator of foundry troubles at the plant of the Studebaker Corp., South Bend, Ind. Mr. Allebach has had 25 years' experience in the foundry, beginning as an apprentice boy at the plant of the National Transit Pump & Machine Co., Oil City, Pa., at the age of 14 years. He continued with this company until about 6 years ago when he took charge of the Dobbie

New Englanders Hold Summer Outing

IN PLACE of the regular summer outing over 200 New England and Canadian foundrymen this season met as guests of the New England Coal & Coke Co. during August for a harbor trip and inspection of the by-product plant at Everett, Mass. The foundrymen met at 11 a.m. in Boston and were taken aboard the steamer CATHERINE *for a trip around the harbor. By special arrangement with the government, the party landed at Ft. Warren and inspected the big guns, the mine laying equipment, and other features of Boston's port defence. Landing at Everett the foundrymen were transferred to five small specially prepared observation cars which were pulled about the 300-acre plant by a small locomotive. Chartered cars of the Boston Elevated railroad took the party from the Everett plant to the City club in Boston where an elaborate dinner was served followed by short talks and a vaudeville entertainment provided by the Keith's circuit. The dinner menu followed through the typical foundry operations such as blast on, first iron, hot iron, etc. Arrangements for the outing were made and carried through by W. J. Lozelle, manager of coke sales, New England Coal & Coke Co. The party is shown in the illustrations in this and the following page.*

A NEW ENGLAND COKE PRODUCER PLAYED HOST TO THE NEW ENGLAND FOUNDRYMEN'S ASSOCIATION IN AUGUST

ENTERTAINMENT AND INSTRUCTION WERE SUPPLIED FOR OVER TWO HUNDRED MEMBERS AND GUESTS

Foundry & Machine Co., Niagara Falls, N. Y., where he remained 2½ years before accepting the position as foundry superintendent of the E. & T. Fairbanks Co., Sherbrooke, Que., Canada.

College Seeks Industrial Co-operation

Carnegie Institute of Technology, Pittsburgh, recently organized an advisory board of Pittsburgh business and scientific men to co-operate with the work of its department of mining and metallurgy. This constitutes another step in line with the policy of the institue to link its educational facilities with outside industry. C. W. Heppenstall, president of the Heppenstall Forge & Knife Co., Pittsburgh, has been elected chairman of the board which includes presidents, managers and executives of 22 large industrial firms in the Pittsburgh district.

The immediate function of the board, according to the announcement, will be to co-operate with the Institute of Technology in the solution of current problems affecting the work of the mining and metallurgy department. Beginning the present college year the institute will give special courses in this department for graduates of liberal arts and technical colleges.

Will Make Patterns

The Saginaw Pattern Works, recently organized by A. J. Fox and C. C. Wood and operating at 217 North Water street, Saginaw, Mich., will make all kinds of pattern equipment, cast match plates and brass and aluminum castings.

Honor Retiring Official

The Steel Founder's Society of America held a banquet Sept. 7 at the Westchester Biltmore country club, Rye, N. Y., in honor of Gilbert H. Johnson, its retiring president. The banquet was attended by a large number of present active members of the society and personal friends of Mr. Johnson, associated with him in the past. A testimonial in appreciation of his services was presented to the retiring president and addresses were made in praise of the energy and devotion expended in the interests of the society during the period of his presidency from Jan. 1, 1911, to July 1, 1923. The program proved successful and made the reunion enjoyable and pleasing to all present.

Philadelphia Foundrymen Open Fall Session

Bronzes and brasses for engineering and commercial purposes, down to date, was the subject of an address delivered by C. R. Spare, president, the American Manganese Bronze Co., Philadelphia, at the first fall dinner and meeting of the Philadelphia Foundrymen's association held at the Manufacturer's club, Wednesday evening, Sept. 12. The talk was illustrated by lantern slides and while the subject matter was nonferrous in character, many of the points raised applied in a pertinent manner to problems incident to the iron and steel casting plants.

Seth Bunker Capp, a lineal descend-

ALL DEPARTMENTS WERE INSPECTED FROM THE COAL UNLOADING DOCKS TO THE COKEMAKING, STORAGE AND SHIPPING

ant of the Bunker Hill Monument family, Boston, addressed the meeting on the prospects, advantages and attractions of the proposed sesqui-centennial celebration to be held in Philadelphia in 1926. He was followed by Col. John Price Jackson, executive director Sesqui-Centennial Exhibition Co., who answered questions proposed by members interested in the subject.

Starts Vocational School

The R. K. LeBlond Machine Tool Co., Cincinnati, has established a vocational school to train young men for the machine tool industry, based on the earn-while-you-learn system of teaching beginners. The minimum of classroom instruction given each week during the course is three hours, and for this the student receives pay at his regular rate. The instruction includes problems in English, mechanics, shop systems, costs and the application of principles of arithmetic, algebra, geometry, and trigonometry to shop work, the problems being taken from practical experience. On the completion of the course, the student is presented with a tool chest, a set of tools, $100 and a diploma. If the student shows himself worthy after the first twelve weeks of the course the company accepts him as an apprentice for 4 years, if he and his parents so desire. The purpose of this instruction is to train the student to the mutual benefit of himself and the company. As a result of the system many graduates are working in the plant, and some of these are engaged in responsible positions in which their school experience is beneficial.

Reorganize Company

The plan for the reorganization of the Iron Products Corp. and its subsidiaries under the corporate title of the Universal Pipe & Radiator Co. has become operative, according to announcement by the committee composed of Clarence M. Schwerin, Thomas Woods and Ira A. Kip. It is expected the new securities will be ready for delivery on or before Nov. 1. The Iron Products Corporation subsidiaries include the Central Foundry Co., Central Iron & Coal Co., Central Radiator Co., Essex Foundry, Chattanooga Iron & Coal Co., Molby Boiler Co., and the Central Foundry Co. of New Jersey.

Will Act as Consulting Metallurgist

William J. Priestley, who is metallurgical engineer at the Pittsburgh office, 817 Oliver building, of the Electro Metallurgical Sales Corp., was until recently, works manager at Midland, Pa., for the Pittsburgh Crucible Steel Co. Prior to that time, he was steelworks superintendent at U. S. navy ordnance plant, Charleston, W. Va. In his new connection, Mr. Priestley will act as consulting metallurgist for the company's customers.

FAKED FOUNDRY FACTS

A DRAWBACK

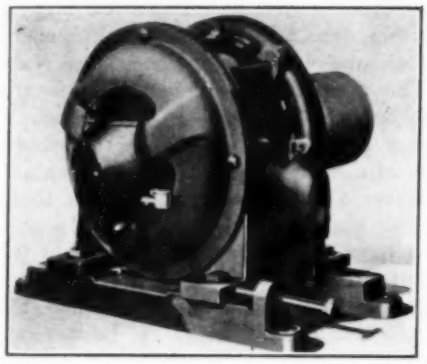
Coke Discussed at Quad City Meeting

Foundry coke was discussed at the first meeting of the Quad City Foundrymen's association for the year 1923-24, held in Moline, Ill., Monday, September 17. Owen Pritchard, assistant general superintendent, the Milwaukee Coke & Gas Co., who read a paper describing the steps through which the coke industry has progressed, explained the difference between the various processes now in use for the production of metallurgical coke. He said that in the early days all the coke was produced in a beehive oven where coal without preparation was placed in the oven and burned for 48 hours to make furnace coke and 72 hours for foundry coke, the theory being that the additional 24 hours was necessary to refine the coke for foundry use. The by-product oven, according to Mr. Pritchard, is a misnomer in that it is often thought that the coke is the by-product when as a matter of fact a by-product coke oven is operated primarily to produce the desired quality of coke. However, in this process all of the volatile matter passing off of the coal during the coking process is collected and condensed so that many valuable products are conserved, such as ammonia, tar, naptha, benzol and numerous other by-products. Lantern slides furnished by the Pickards-Brown Co., Chicago were presented, showing in detail the process of manufacture and the enormous mechanical equipment necessary to produce a good grade of foundry fuel. George A. T. Long, in charge of the service department of the Pickands-Brown Co., gave a technical discussion of the various elements in foundry coke that either tend to help or trouble the foundryman. The meeting was closed by an address by J. C. Mears of Rogers, Brown & Co., St. Louis. Mr. Mears stated that he did not believe the local foundrymen appreciated the benefit derived from local associations.

Reports American Views on Bar

(*Continued from Page* 784)

mold, there is every chance of an interior shrinkage, or at least porous metal in the lower portion of the casting. To avoid chance of variation in the character of the mteal through different cooling rates as well as imperfect feeding, the American arbitra-



THE RUGGED CONSTRUCTION IS ACCOMPLISHED BY CASTING THE FEET INTEGRAL WITH THE FLANGES

tion bars are top poured as a matter of specification.

A final precaution taken with the bars when cast is that they are not put into tumbling barrels for cleaning, but simply are brushed to remove adhering sand. Ever since the famous investigations of Outerbridge, who proved conclusively that tumbling test bars would, by relieving molecular stresses, increase the strength materially, this point has been watched carefully in specifications.

Build Heavy Duty Motor

An alternating current, induction motor is being produced by the Reliance Electric and Engineering Co Cleveland, which they believe is well constructed for hard service such as a motor in a factory or foundry is expected to withstand. The features which the manufacturers claim are responsible for the ability of the motor to stand up are the stator winding insulation, the bearings, the rotor construction, and the high overload torque capacity. The stator punchings are made of special electrical sheets and are attached to the ends under 10 tons pressure by rivets. The slots in the stator punchings are partially closed and at the top are 1/8 inch wide. As a result the winding is easy and the manufacturers claim that the overload torque capacity is thereby increased. The insulation of the stator winding consists of specially combined pressboard and oiled muslin, and several coats of baked insulating varnish to resist the destructive influences of dirt, acid, and alkalies. The bearings are made of phosphor bronze and the bearing pressure claimed for the bearing design is less than 30 pounds per square inch. The rotor core is made of special electrical sheets punched to receive the rotor bars, which are made of copper. An end ring of copper is castwelded to the ends of the bars.

Spindle Sander Has An Oscillating Motion

To meet the needs of the pattern shop or wood working factory where the amount of internal or irregular work to be done does not justify the buying of a larger machine, the Porter-Cable Machine Co., Syracuse, N. Y. recently has placed an oscillating spindle sander on the market. A view of the new machine is shown in the accompanying illustration.

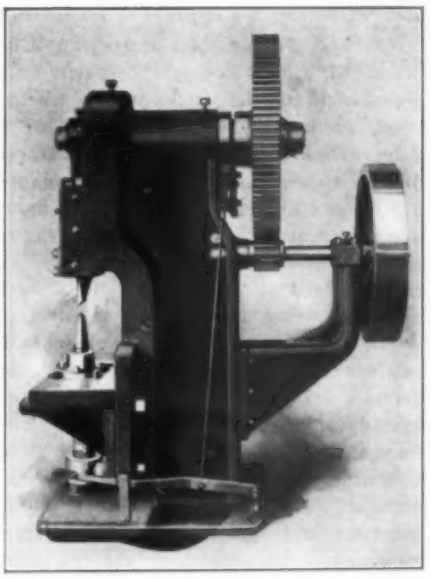
This machine is equipped with an electric motor which has a speed of 1725 revolutions per minute and is totally enclosed. The motor is connected direct through the spindle which

SMALL SANDER WHICH IS USED IN INTERNAL OR IRREGULAR WORK

has an oscillating movement of 1-inch, is equipped with ball bearings and furnished with a 2½ x 6-inch roll. The table of the machine is ground, tilts 45 degrees down and 15 degrees up and is 16 inches in diameter. The weight of the machine is 75 pounds and the overall dimensions are 16 x 16 x 25 inches. The device may be placed on a pedestal if desired.

Design New Sprue Cutter

A sprue cutter capable of steel foundry work is being placed on the market by the Hanna Engineering Works, Chicago. The accompanying illustration shows that the main features of its operation. The knives move a distance of



THE KNIFE THRUST BEGINS AT THE BOTTOM AND OPERATES THROUGH A THICK STEEL SCREW

1¾ inches and their capacity is 1¾ inch in squares or 3 square inches in cross section. Three sets of knives and an adjustable knife holder are furnished with the machine.

The body is made of semisteel, while the table, cross head and connecting rod are steel castings. Both gears are cut and the large one is of semisteel while the pinion is made of steel. The main shaft is a 0.40 carbon steel rod. A 4½-inch forged steel screw propells the knife thrust, and also is used for elevating the table.

A 5-horsepower, direct current, or a 7½-horsepower, alternating current motor with about 1100 revolutions per minute is required to drive the gears. The motor generally is connected by a belt to the flywheel, and running at this rate of speed produces 30 strokes of the knive per minute. Moving parts in front of the machine are covered, and gear guards are provided for the bull gear and pinion. The weight of the entire machine is 10,000 pounds.

Rules For Sand Blast

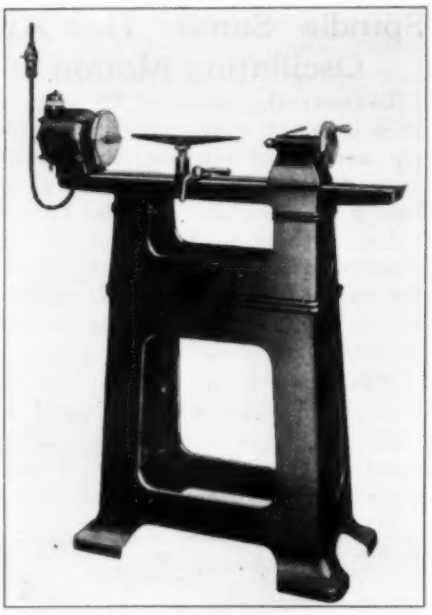
The New Jersey bureau of hygiene and sanitation requires that sandblast cabinets be equipped with reasonably dust tight flaps or similar protective device conveying the two openings through which the worker's hands must be inserted. These should be mechanically exhausted by at least a 3 or 3½-inch pipe connected to a fan system, through which a linear air velocity of at least 2000 feet per minute is maintained. If a cover of fine wire gauze protects the back of the glass window through which the operator watches his work, the glass will not become clouded by the abrasive action of the sand.

Develop Tractor Trucks

Yale & Towne Manufacturing Co., Stamford, Conn. has just completed its series of industrial trucks with a tractor truck to meet the requirements of a three wheel tractor job. The features of this truck shown in the accompanying illustration emphasized by the manufacturers are its low center of gravity and arc welded frame. By means of the low center of gravity the danger of overturning is reduced to a minimum. The frame is suspended on helical springs over each wheel and the driver's seat, which is further protected by an additional spring, swivels. The frame is made of heavy pressed steel, combining all the necessary parts, including the battery compartment, bumpers, and deck into a solid and rigid structure. The area of the platform is 15 square feet, but the mnaufacturers claim that the machine will pass a three-foot doorway or a seven-foot elevator. As shown in the illustration the steering handle is mounted on top of the stearing column. The machine is specially designed to give the operator an opportunity of getting off the machine with the greatest facility and to give him a clear view necessary for safe operation.

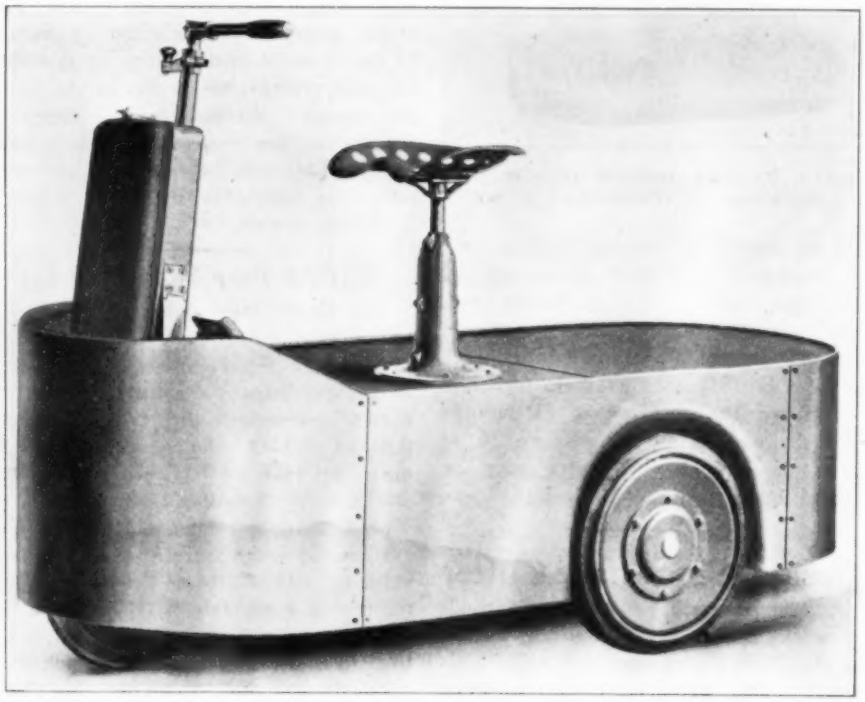
Bench Lathe Driven by Electric Motor

A small electrically driven woodworking lathe has been placed on the market by J. D. Wallace & Co., Chicago, manufacturers of portable bench machines. The fact is emphasized that it



THE TOOL REST CLEARS THE CENTER OF THE SPINDLE AXIS BY 5 INCHES

is one of the smallest lathes constructed and is designed to do the smaller turning operations in many woodworking and pattern shops more speedily and economically than they could be done on larger machines. The machine shown in the illustration handles work up to 6 inches in diameter and has a maximum distance of 24 inches between centers. The number of revolutions per minute are set at 3400, because at this speed the manufacturers believe that woodwork up to 6 inches in diameter can be handled most practically and scientifically. The lathe is driven by a 1/3-horsepower electric motor which provides ample power for cutting up to the limit of the lathe. It is 46 inches high and 40 inches in length over all. The motor is direct connected to the lathe spindle, and the whole shaft is dust proof. The tail end of the spindle is adjustable. The sub-base is open and serves as a convenient holder for tools. The whole machine weighs 203 pounds, and can be moved at will. One of the purposes of the manufacturers in producing this model was to make the lathe sufficiently light to be handled easily, and yet sufficiently rigid to prevent vibration.



THE CURVED LINES OF THE TRUCK ARE CONDUCIVE OF PROGRESS IN CONGESTED PLACES

Offers Suggestions for Sand Economy

Several bulletins are being distributed by the Whitehead Brothers Co., New York, which discuss the relative cost of good and poor sand in the ultimate accounting. The message which they seek to convey is particularly aimed at gray iron and malleable iron foundries. The suggestions found in these booklets are gathered from users of sand produced by the Whitehead Brothers Co. A table of foundry costs is given, showing the relative importance of items such as metal, fuel, sand and labor. The principle which it aims to show is that an increase in the cost of a smaller item in the production costs, such as sand, cannot equal the resulting saving in obtaining better castings. A test is also recommended for determining in a practical way the flowing qualities of a particular molding sand. The remainder of the bulletins is devoted to a description of the various classes of sands produced by the company and the methods used in their production.

Opens Canadian Shop

The G. and J. Weir Co., Delorimier avenue, Montreal, Canada, subsidiary to the G. and J. Weir Co., engineers and pumpmakers, Cathcart, Glasgow, Scotland, has opened its foundry at Ville La Salle, Montreal. The building was erected and fully equipped three years ago, but lack of business prevented operations being started until this year. The plant is now operating at about seventy-five per cent of capacity. Thomas Cruikshank is foundry superintendent.

Glancy Malleable Corp. has been organized with a general office at Waukesha, Wis., with plants at Waukesha and Janesville, Wis. The officers are: A. R. Glancy, president; L. A. Williams, vice president; E. F. Carson, treasurer; L. D. Harkrider, secretary.

Buying Below Expectations

Equipment Sales so far This Year Above Those of Last Year but Volume of New Orders Is Slackening—Some Building Under Construction Nearly Ready for Placing of Orders

ALTHOUGH present conditions in the foundry equipment industry are not as active as they have been in the earlier months of the year encouragement is found in the report made by 13 of the leading producers of foundry equipment that sales for the first 8 months of this year were 65 per cent greater than for the corresponding period of last year, and greater than the entire sales last year. During the summer months the slack in equipment buying was attributed to vacation time and many firms expected a large increase of orders with the fall months. So far orders have not increased to the extent expected, especially in certain lines. New building is offering business to the equipment manufacturer. The Canadian Westinghouse Co., Hamilton, Ont., Canada is receiving bids for the erection of a foundry for which equipment will be purchased at a later date. The Austin Co., Cleveland is building a number of foundries, among which is the new shop for the Cadillac Motor Car Co., Detroit. Bids are being asked for some of the equipment for the core department and equipment for the foundry is nearly ready to be put out for bids. A battery of three oil-fired core ovens has been sold to the Erie Forge Co., by the Foundry Equipment Co., Cleveland. The W. W. Sly Mfg. Co., Cleveland has sold equipment in the Detroit district including an order for tumbling mill equipment from the Ford Motor Co.; dust arrester equipment to the Cope-Swift Co.; and a complete sand-blast room with dust arrester equipment to the United States Radiator Co. In Ohio the same company has sold cinder mill equipment to the Columbus Brass Co., Columbus; and three large sand blast rooms, and tumbling mill and dust arrester equipment to the Marion Steam Shovel Co., Marion. Sand blast equipment has been sold by the Pangborn Corp., Hagerstown, Md., to the Buckeye Traction Ditcher Co., Findlay, O., the Shepard Art Metal Co., Detroit; the Lima Locomotive Corp., Lima, O.; the Vulcan Plow Co., Evansville, Ind.; and the Lebanon Steel Foundry Co., Lebanon, Pa. The last two companies also have purchased dust arresters.

Pittsburgh District Encouraged

RECENT surveys in the foundry equipment market in the Pittsburgh district reveal the fact that while sellers do not disguise the fact that the market is quiet at present, enough business is in prospect to warrant optimism. During the past few days more inquiries have come out for molding machines and other equipment, including one proposition which requires two fair sized cupolas. Buyers are taking a breathing spell but the consensus of opinion is that there is no real departure and that numerous purchases will be made this fall and winter. Several car-wheel and other specializing foundries contemplate molding machine installations at an early date and some already have placed their verbal orders. Actual sales made recently by the Herman Pneumatic Machine Co. include two large machines to the Rensselaer Valve Co., Troy, N. Y., and one each to F. Ferguson & Son, Hoboken, N. J., and to the American Laundry Machine Co., Rochester, N. Y. The delivery situation as regards molding machines is exceedingly satisfactory since numerous standard sizes can be delivered from stock. Others unusually large or extensive have to be made up to order and take several weeks. Miscellaneous sales of foundry flasks and wheelbarrows as well as other small supplies continue at about the same rate that has prevailed for several months past. The Textile Machine Works, Wyomissing, Pa., the new owner of the Edwin A. Moore Foundries at Fort and Rebeson streets Reading, Pa., is understood to be planning extensions and may soon inquire for equipment. Recent crane and hoist sales to foundries have been few and far between. The Lorain Steel Co., Johnstown, Pa., however, closed with the Northern Engineering Works, Detroit, on a 3-ton, 3-motor electric traveling crane, and the Pennsylvania Casting & Machine Works, Pittsburgh, bought a 3-ton crane from an unidentified builder. The largest crane installation for a foundry made recently is that of the Pittsburgh Plate Glass Co. at its New Creighton, Pa., works, involving one 6-ton and four 7½-ton cranes instead of three cranes as announced recently. The order went to the Alliance Machine Co., Alliance, O.

More Business in East

FOLLOWING several weeks of sluggishness, demand for foundry equipment the past few days has undergone a spurt. Orders have not been large or numerous; but inquiry has been substantially better. As there is little in the way of new construction at present, the bulk of this demand is for equipment for replacement purposes. However, one list of about $20,000 is pending for a new foundry for the Newark, N. J., board of education, and plant expansion is contemplated in two or three quarters for the near future. J. E. Biggins Co., Brooklyn, will start work shortly on an iron foundry addition, and the Dempsey Furnace Co., 15 Park Row, New York, contemplated the erection of a plant at Jersey City, N. J., to include a foundry. The Baker Mfg. Corp., Saratoga Springs, N. Y., is in the market for an overhead crane and according to reports plans to bring out list of additional equipment shortly, all for an addition to its gray iron foundry. Among recent buyers are the David E. Allen Yonkers Foundry, Inc., Yonkers, N. Y., which has closed on a 10-ton cupola to the Whiting Corp., and the Excel Mfg. Co., Lebanon, N. J., which has purchased a 2-ton overhead from the New Jersey Foundry & Machine Co. Two substantial orders have recently been placed by companies identified with the railroad industry, but formal papers have not been drawn up. Quotations on foundry equipment appear virtually unchanged, although one leading interest plans to increase prices on sand-blast equipment about 20 per cent. A number of furnaces and equipment have been sold by F. J. Ryan & Co., Philadelphia, including 10 brass melting furnaces to the Reading Hardware Co., Reading Pa.; automatic control for pipe annealing furnace

to the United States Cast Iron Pipe & Foundry Co., Birmingham, Ala.; and burner equipment for its entire battery of ovens, to the Penn Seaboard Steel Co., Tacony, Pa.

Fewer Sales and Inquiries Reported

MANUFACTURERS of foundry equipment in the Chicago district report fewer sales and inquiries in September than in August, with the prospects of improvement in the immediate future not bright. Sales of molding machines by Henry E. Pridmore include one each to the Standard Foundry Co. and the Kensington Foundry Co., both of Buffalo. Frank D. Chase Inc. has rehabilitated the foundry of the American Malleable Castings Co. at Marion, O., putting in a new core room and heating plant. The same interest has effected a rearrangement of material storage, especially facing sand, and has installed two units of sand-handling apparatus for the American Manganese Steel Co., Chicago. Still another improvement by the Chase organization has been the increase in the capacity of the Carbon Steel Casting Co., Pittsburgh, where the number of molders has been increased from 50 to 100. Further delay is reported in going through with the project for a new foundry for the Somerville Stove Works, Somerville, N. J.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Work has started on the erection of a new enameling plant for the Topton Foundry Co., Topton, Pa.

The Diamond Foundry & Machine Works has been incorporated for $14,100 by George J. Barrett, L. P. Hacker and R. M. Pyron.

The Plainville Casting Co., Plainville, Conn., has increased its capital stock from $50,000 to $100,000.

Charles Rothert has been named receiver for the Miami Machinery & Foundry Co., Toledo, O.

Capital stock of the Birmingham Iron Foundry, Derby, Conn., has been increased from $150,000 to $1,200,000.

The plant of the Lakeside Malleable Castings Co., Racine, Wis., will be entirely remodeled and an addition, 40x120 feet, made.

Plans are being prepared by John D. Biggins Co., Inc., Brooklyn, for a 1-story foundry addition.

The Lennox Furnace Co., Marshalltown, Iowa, is starting construction of a third unit to its factory in this city, to house a tin shop.

Fire recently damaged the plant of the American Aluminum Ware Co., 305 South Seventh street, St. Louis, with a loss of approximately $75,000.

Connecticut Foundry Co., Rocky Hill, Conn., now controls the Valley Foundry Co., Hampton, Conn., following the latter's recent reorganization.

The Garden City Sand Co., a $100,000 corporation engaged in buying and selling foundry sand and building materials has applied for a Wisconsin charter.

The Cleveland Range Co., Cleveland, was incorporated by W. L. Sellbach, H. R. Lynn, J. A. Smith, J. W. Smith and Charles H. Olds, with a capital of $60,000.

A brass and iron foundry will be established in Massena, N. Y., for Howard C. Munson, by Harry Oswell, 309 Hall block, Watertown, N. Y.

An 80-acre site has been purchased by the York Mfg. Co., York, Pa., in that city, for the erection of a gray iron foundry. A pattern shop is also being contemplated.

A voluntary petition in bankruptcy has been filed by the Palmer Foundry & Machine Co., Palmer, Mass., showing assets of $60,291 and liabilities of $142,726.

Wilson Foundry & Machine Co., South Saginaw street, Pontiac, Mich., has let the general contract to the Bryale Construction Co. for a $500,000, 2-story reinforced concrete building.

The Spring City Foundry Co., Philadelphia, was incorporated for $225,000 to manufacture iron castings, by F. R. Hansel, E. M. McFarland and J. Vernon Pimm.

Baker Mfg. Corp., Saratoga Springs, N. Y., manufacturer of gray iron castings, is preparing plans for the construction of a $45,000 addition to its plant.

The Warren Steel Casting Co., Fairview avenue and the Kingshighway, St. Louis, has completed plans for the erection of a 2-story foundry costing $55,000.

A concrete and steel powerhouse, 33x111 feet, costing $6000 will be built by the Washington Iron Works, Seattle. This will be the third unit of the plant, a foundry and machine shop already being under construction.

The Columbia Malleable Iron Works, Euclid and Atlantic avenues, Brooklyn, N. Y., is preparing plans for the construction of a 1-story machine shop and foundry to replace the works damaged recently by fire.

The new foundry of Suton, Steele & Steele, Dallas, Texas, is nearing completion. The new building will house manufacturing facilities. The company maintains a general foundry business in addition to its manufacturing line.

Construction is in progress on a 30x80-foot foundry for the Brainerd Foundry Co., Brainerd, Minn., manufacturer of gray iron, brass and crucible steel castings. Purchase of equipment for the new plant has not been made.

Demsey Furnace Co., 15 Park row, New York, will manufacture oil-burning equipment as well as furnaces now produced, at its new plant to be built on a recently acquired site at 61-63 Cornelison avenue, Jersey City, N. J.

Contract for the construction of an addition to the foundry building at the northeast corner of State road and Hellerman streets, Philadelphia, for the Dodge Steel Works, was let to the Austin Co., Cleveland. The addition is to cost approximately $20,000.

The Wilkinson Foundry Facing & Supply Co., Ltd., Toronto, Ont., has been incorporated to manufacture and deal in iron, iron ore and products such as foundry facing and supplies, with $100,000 capital by John C. Wilkinson, William J. B. Wilkinson and Frank E. Corby.

The Stalker Engineering Co., Ltd., Simcoe, Ont., has been incorporated to carry on a business as iron founder, mechanical engineer and manufacturer of machinery, with $50,000 capital, by John M. Stalker, Mary Stalker and William D. Stalker.

Hockanum Mills Co., Rockville, Conn., bought the property of the late Herbert B. Mullness, iron founder of that city. Activities are expected to start shortly in the foundry which has been idle several years since the death of Mr. Mullness. The plant, valued at $50,000, was sold at $8000.

Incorporation was recently effected by Joseph W. Hays, Philip T. Sprague, Dr. R. B. Jones and Alva F. Orcutt of the Hays Brass & Aluminum Foundry, with a capital of $50,000, to build a plant in Laporte, Ind. The Laporte plant will be a branch of the works at Michigan City, Ind.

Following the recent reorganization of the Crawford & McCrimmon Foundry & Machine Co., Brazil, Ind., plans were made for the expansion and development of a line of mining machinery and parts. Hugh Stevens, president of the First National bank, Brazil, heads the new company.

New Trade Publications

ALUNDUM PRODUCTS—A 16-page bulletin has been issued by the Norton Co., Worcester, Mass., illustrating the use of alundum safety treads in a newly erected buliding. This booklet describes mainly safety stair and floor tiles, which the manufacturers says are slip-proof. The tiles as illustrated are either made of alundum aggregates alone or combined with marble chips. The aggregates are made of abrasives held together by a vitrified bond. Ten illustrations show the adaptability of the numerous color combinations which can be furnished. The treads are claimed to be duable, fire-resisting, and suitable for practically every type of building.

WELDING AND CUTTING EQUIPMENT—A forty-eight-page bulletin has been prepared by the Bastian-Blessing Co., Chicago in which welding, cutting, brazing, soldering, lead burning and carbon burning apparatus manufactured by that company is completely described. The feature emphasized by the manufacturers is their model torch by means of which it is said that a thorough mixture of oxygen and acetylene is achieved, making the flame clear and true and nonoxidizing. In the acetylene generator which it also manufactures the manufacturer calls attention to one detail of construction because of which the flashback chamber must be filled with water before the generator if filled and the possibility of a dangerous explosion reduced to a minimum. The generators are made for 100, 50, and 25 pounds rated carbide capacity. The torches are made for different rates of gas consumption and for various uses.